Analysis of vascular access in hemodialysis unit of a tertiary care hospital

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ABSTRACT

A well functioning vascular access (VA) remains a major obstacle in the management of patients with end-stage renal disease (ESRD) on maintenance hemodialysis (MHD). In a case series we analyzed 107 patients (68 males and 39 females) who had been on HD for a period ranging from 1 to 168 months. Their mean age was 50.44 years (range: 18 to 85 years). The study aimed at analyzing the VA, including the management of its complications. In 63 patients (59.8%), HD was initiated through a temporary catheter due to late detection of chronic kidney disease (CKD) and delayed referral and 43 (40.2%) started HD with AVF. 93.5% had AVF as their permanent VA. Total 64 (59.8%) complications occurred in 107 patients and the venous aneurysm was the most common complication (48.4%) followed by the VA thrombosis (34.3%). During mean 3.4 years, 75 (70.1%) patients underwent VA creation only once while 24 (22.4%) had to undergo twice and 8 (7.5%) were those who had to get it created more than twice. Only 2 (3%) of these patients underwent interventions for VA complications. Early detection of CKD and referral to a vascular surgeon and a multidisciplinary approach is required for creation and maintenance of VA.

Key Words: *Hemodialysis, Vascular access, Complications.*

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INTRODUCTION

A vascular access is a surgically created vein used to remove and return blood during hemodialysis (HD). VA may be in the form of central venous catheter (CVC), an arteriovenous fistula (AVF) or an arteriovenous graft (AVG). AVF is a connection, made by a vascular surgeon, of an artery to a vein. AVG may be of biologic or synthetic material that is inserted between artery and vein. HD is the most common modality of renal replacement therapy (RRT) [1]. For successful performance of MHD, it is necessary to establish and maintain a proper VA, it is also essential to ensure a good clinical result, good quality of patient life [2] and survival[3]. CVC as a vascular access is associated with higher risk of death[4]. Other common complications of CVC include infection and thrombosis. But still a high percentage of HD population starts HD with CVC due to late presentation of CKD and lack of time for arteriovenous VA[5]. National Kidney Foundation-Kidney Disease Outcome Quality Initiative (NKF-KDOQI) recommends AVF as the first line option for MHD[6] .AVF and AVG are also not free of complications and these may include outflow venous stenosis or obstruction, VA thrombosis, aneurysmal dilatation or rupture of the outflow vein. The management of the complications associated with VA remains an issue in the developing countries and it may results in loss of VA. Despite the technological advances made in the field of HD, VA continues to be a significant economic, surgical, and logistic problem for patients and their medical care providers[7].

The present study aimed at describing the VA profile, its complications and their management in patients on HD in the dialysis unit of a tertiary care hospital.

OBJECTIVE:
Internal analysis of VA profile in a hemodialysis unit of a tertiary care hospital.

Material & Methods:
It was a case series which included 107 patients from a hemodialysis unit of Jinnah Hospital Lahore (a tertiary care hospital) after informed consent. Data was collected on a standardized questionnaire and it included patient's demographic features, and the details of total vascular accesses (including total number and types of accesses, their complications and their management). Data were analyzed using software SPSS version 23. Percentages and frequencies were calculated for nominal data and median standard deviations were calculated for continuous variables.

RESULTS

Table 1: Demographic and clinical characteristics of the participants

Total participants (n=107)	No.	Percent
Mean age = 50.44 years, SD= ±14.8		
Male	68	63.6
Female	39	36.4
Current vascular access		
CVC	3	2.8
AVF	100	93.5
AV graft	4	3.7
Vascular access at the start of hemodialysis		
CVC	63	58.9
AVF	43	40.2
AV graft	1	0.9
Duration of dialysis Mean = 41.6 months (3.46 years) SD ±35.1		
< 1 year	26	24.3
1 - 3 years	36	33.6
3.1 - 6 year	27	25.2
> 6 years	18	16.8

Table 1 shows the baseline characteristics of the participants.

Their mean age was 50.44 years with SD +14.8. Of 107 patients 68 (63.6%) were males and 39 (36.4%) were females. Most common VA for MHD was AVF that was found in 100 (93.5%) patients followed by AVG in 4 (3.7%) of participants while only 3 (2.8%) patients were using CVC and they were in line for their VA creation. 63 (58.9%) patients started their HD with CVC and later they had AVF created, 43(40.2%) patients initiated HD with AVF while only 1 (0.9%) did with AVG. Mean duration of HD was 41.6 months (3.46 years). 36 patients were receiving HD for 1-3 years, 27 between 3 to 6 years while 26 patients were having dialysis for less than 1 year. There were 18 individuals whose HD treatment had been going on for more than 6 years. Total 64 (59.8%) complications occurred in 107 patients.

Table 2: Total and differential complications of VA

Complications of VA	No.	Percent
Total Complications	64	59.8
Distal ischemia	4	6.25
Aneurysm	31	48.4
Rupture	1	1.5
Thrombosis	22	34.3
Venous outflow obstruction	4	6.25
Central venous stenosis	2	3.1

(Table 2). Most commonly encountered complication was VA aneurysm i.e. 31(48.4% of all complications) followed by VA thrombosis i.e. 22 (34.3%). Other less common complications included distal ischemia, venous outflow tract obstruction and central venous stenosis.

Table 3: Vascular access created

No. of VAs created	No.	Percent
One	75	70.1
Two	24	22.4
> 2	8	7.5

Table 3 shows total number of VAs created in all the participants and reveals that 75 (70.1%) individuals had only one VA created while 24 (22.4%) had 2 and 8 (7.5%) had more than 2 VAs created. Only 2 (3%) patients underwent interventions for their VA complications. One (1.5%) had angioplasty done for central venous stenosis and the other one (1.5%) underwent surgical ligation of ruptured AVF.

Table 4: Interventions done for VA complications

Intervention	No.	Percent
Angioplasty	1	1.5
Surgical ligation for AVF rupture	1	1.5

DISCUSSION

Establishing and maintaining a proper VA is necessary for successful performance of HD. Analysis of VA for HD in our unit showed 93.5% patients using AVF as their VA for HD which is consistent with NKF-KDOQI recommendations[6]. 58.9 % of our HD population started their dialysis with CVC which is a number comparable to that found in other studies[4-8-9]. Surprisingly 40.2 % patients were found to have initiated their HD with AVF which is contradictory to our routine clinical observation where most of the patients do start HD with CVC.

A report from an HD unit in Karachi found 80 % patients started HD with CVC 10 and the present study shows that awareness has increased in past few years. High proportion of patients using CVC as first VA was due to delayed detection of chronic kidney disease and most of our renal patients are usually not under the care of nephrologists in their pre-dialysis follow up and they are often referred very late for specialized care. In 107 patients, 64 (59.8%) complications occurred with aneurysmal dilatation being the most frequent complication (48.4%) followed by VA thrombosis (34.3%). Only 1 patient, amongst those having aneurysmal dilatation, had ruptured AVF which was ligated surgically. Only 2 (3%) of these patients who had these complications underwent interventions as already mentioned in results. This shows the limitation of the available resources for management of these complications.

During mean 3.4 years, most of the participants (70.1%) had only 1 VA created while 22.4 % had to undergo VA creation twice and 7.5 % patients needed more than 2 procedures of VA creation. This requirement of multiple procedures was due to repeated loss of VA on account of non-availability of the resources for the management of VA complications. This repeated need for VA creation remained a source of interruption in the proper follow up of the dialysis schedule and it also caused an economic burden for the patients and health care system.

CONCLUSION

Although most of the CKD patients requiring RRT use CVC as an initial VA for HD but the proportion of patients starting HD with AVF has increased in the recent past which is an indicator of better level of awareness. However, the availability of a well-functioning VA remains an Achilles heel for the patients on MHD. Early diagnosis of CKD allows creation of native AVF before ESRD sets in and, consequently, usage of a temporary catheter can be avoided. Regular monitoring of the VA and a close working relationship between nephrologist, vascular surgeon, interventional radiologist, and nurses along with enhanced resources for VA management can ensure prolonged survival of VA and better treatment of its complications. This will result in reduction of the number of VA losses and will improve the quality of life and survival of the patients and will also reduce the cost of health care.

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