Fistula First – Are We There Yet? A Multicenter study.

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Abstract:
"Fistula First" for initiation of hemodialysis (HD) has been touted vigorously over the last few years. Vascular Access (VA) – Arteriovenous Fistula (AVF) and Arteriovenous Graft (AVG) are rightly considered to be the life line of patients on maintenance hemodialysis. In our resource constrained setups, patient refusal and delay in formation of the VA as well as its failure is rather common.
Objective:
The objectives of our study were to document the frequency of use of temporary vascular access (temporary vascular catheter) at the initiation of dialysis, prevalent VA and factors associated with failure of vascular access.
Methods:
Total of 394 patients undergoing hemodialysis in six hemodialysis units in Lahore, Pakistan were included in the study. Patients were interviewed and records checked for the vascular access used to initiate hemodialysis and types and number of vascular access made. Pearson correlation was also used to identify correlation between different variables.
Results:
Majority (n=350, 88.8%%) of the patients started their dialysis with temporary catheters. At the time of collection of data most of the patients had AVF (n=335, 85%) followed by permanent catheter (n = 28, 7.1%), AVG (n=14, 3.5%) and temporary vascular access (n=17, 4.3%). More than half (59.6%, n=208) of the patients with Permanent VA (i.e. AVF and AVG) had at least one access failure and 22.9% (n=80) patients had more than one failure. Delay in access formation correlated significantly although weakly with VA failure rate.
Conclusions:
Our patterns of vascular access indicate delay in formation of VA resulting in a high use of temporary catheter for initiation of maintenance hemodialysis and a high rate of failure of VA.

KEY WORDS:
Permanent Vascular Access, Arteriovenous Fistula, Arteriovenous Graft, Vascular Access Failure, Permanent Catheter, Temporary Catheter.

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Introduction

Dialysis is a lifesaving treatment in patients with kidney failure. Permanent vascular access in the form of either AVF/AVG or permanent indwelling catheter makes life-saving hemodialysis treatment possible. There has been general agreement that AVF followed by AVG are the preferred mode of vascular access in patients requiring maintenance hemodialysis[1,2]. The efforts at creating optimum awareness about Fistula First initiative were started after landmark studies e.g DOPPS revealed that the number of patients initiating maintenance hemodialysis with a vascular catheter (temporary or permanent) was unacceptably high[3]. However response has been dismal[4,5,6] including in our region[7]**.** According to this initiative the current target is aimed to have at least 66% of prevalent patients undergoing HD with an AV fistula. It is also suggested that number of patients initiating maintenance hemodialysis via temporary catheters should be less than 10%[8].

We feel that in developing world we still lag behind on the perceived ideals for chronic maintenance hemodialysis patient population in regards to permanent vascular access.

Objectives:

The objectives of our study were to document the frequency of use of temporary vascular access (temporary vascular catheter) at the initiation of dialysis, prevalent VA and factors associated with failure of vascular access.

Materials and Methods:

This was a cross sectional study which was undertaken from August 2014 to January 2015 at six dialysis centers in Lahore (with a population of >10 million), Pakistan, after approval by the Institutional Review Board. The centers

were: Fatima Memorial Hospital, Omar Hospital, Khair-un-Nisa Hospital, Cavalry Hospital, Nawaz Sharif Hospital Yakki Gate and Mian Munshi Hospital. A total of 480 patients were evaluated and 394 patients were included in the study after obtaining informed consent. Rest of the patients (n=86) were excluded because they failed to accurately recall their VA history or refused to participate in the study. Data was collected on a specialized proforma. Data collected included demographics (age, gender, cause of chronic kidney disease (CKD), co-morbid conditions) as well as particulars about vascular access (time lapse between recommendation and actual formation of VA, initial type of VA and number of failures of AVF). Data was analyzed using SPSS version 22 and is presented as actual numbers (N), means $\pm$ SD and frequencies. Pearson's correlation coefficients were checked for significant relationship between variables.

Results:

Demographics of the cohort are presented in Table 1 whereas Table 2 presents the pattern of vascular access in our cohort.

Diabetes mellitus (DM) remains the most common cause of CKD in patients undergoing maintenance hemodialysis whereas hypertension (HTN) was the most common co-morbidity (Table 1).

Table 1: Baseline characteristics of 394 patients undergoing hemodialysis.

	Total Cohort	**Patients without AVF/AVG Failure**
Total Number of Patients. (N)	394	141. AVF: 136 (96.4%) AVG: 5 (3.6%)
Age (years) ≤ 60 > 60	50 $\pm$ 14.4 (Range: 18 – 90 years) 313 (79.4%) 81 (20.6%)	51.8 + 15.3 (Range: 18 – 90) 104 (73.7%) 37 (26.3%)
Gender	M: 225 (57.1%) F: 169 (42.9%)	M: 83 (58.9%) F: 58 (41.1%).
CKD Cause Diabetes Mellitus. Hypertension. Chronic Glomerulonephritis. Others[1]. Unknown.	 200 (50.8%) 129 (32.7%) 23 (5.8%) 38 (9.6%) 4 (1%)	 75 (54.3%) 45 (31.9%) 14 (9.9%) 6 (4.2%) 1 (0.7%)
Co-morbidities Diabetes Mellitus. Hypertension. Coronary Artery Disease Chronic Hepatitis C (with or without Chronic Liver Disease) None	 26 (6.5%) 174 (44.2%) 71 (18%) 13 (3.3%) 110 (27.9%)	 16 (11.6%) 51 (37%) 31 (22.5%) 8 (5.8%) 35 24.8%)

1Stone disease, ADPKD, CPN, TIN.

Mean numbers of vascular accesses made in our cohort was 1.9 $\pm$ 0.99 (Median: 2.0; Range: 1 – 5). Mean duration of each vascular access is shown in the table 2, which also shows the characteristics of patients without VA failures.

The mean time lapse between clinical decision to get a vascular access made and actual formation of vascular access was 11.7 $\pm$ 20.8 months (range: 0 –110.8) (Table 2) where zero denotes
immediate formation of vascular access. Although, majority patients had initial VA made within one year of recommendation – among these 64% (n=252) still waited for at least six months before getting a VA and yet another 6.6% (n=26) waited for more than 3 years. (Table 2

Mean duration of hemodialysis in our cohort was 20.85 $\pm$ 23.1 months (Range: 0 – 144.7). Almost half of the patients (51.3%; n=201) were on dialysis within one year of advice to start dialysis whereas 28.7% (n=113) were able to delay for 2 to 5 years.

Time delay between recommendation and initiation of dialysis (Pearson's r: 0.194, p: < 0.01, N=349) and presence of diabetes (Pearson's r: 0.146, p: 0.007, N=349) correlated weakly albeit significantly with failure of VA. Age, gender, cause of chronic kidney disease or duration on dialysis did not correlate with VA failure.

Table 2: Characteristics of vascular access in 394 hemodialysis patients relating to its initial vascular access, time lapse between advise to create fistula and actual creation of permanent vascular access furthermore access failure and its duration of working.

	Total Cohort	**Patients without AVF/AVG Failure**
Mode of Initiation		
Temporary Catheter	350 (88.8%)	112 (32%)
AVF	43 (10.9%)	29 (67.4%)
AVG	None	None
Peritoneal Dialysis	1 (0.3%)	None
Time Lapse[1] (Months)	11.7 ± 20.8 (0 –110.8)	15.95 ± 25.85
≤ 1 year.	310 (78.9%)	99 (70.2%)
> 1 year.	84 (21.3)	42 (29.8%)
Mean Number of Vascular Accesses made.	1.9 + 0.99 (Median: 2.0; Range: 1 – 5)	
Functional Vascular Access[2].		
AVF.	335 (85%)	136 (96.4%)
Permanent Catheter.	28 (7.1%)	None
AVG.	14 (3.6%)	5 (3.6%)
PVA not made/functionality not ascertained[3].	17 (4.3%)	None
Duration of Functional Permanent Vascular Access (AVF & AVG). (Months).		
First VA (N=349)	26.6 ± 54.3 (Range: 0 – 108)	22.40 ± 23.59 (N=141)
Second VA (N=191)	68.3 ± 93.2 (Range: 0 – 144)	
Third VA (N=76)	49.8 ± 74 (Range: 0 – 66)	
Fourth VA (N=37)	49.1 ± 63.4 (Range: 0 - 66)	
Failure of Permanent Vascular Access (AVF & AVG).		
AVF:	335	
None	136 (40.6%)	
Once	119 (35.5%)	N/A
More than once.	80 (23.9%)	
AVG:	14	
Reconstruction required	9 (64.3%)	

1: Time lapse between decision and actual formation of PVA. 17 patients who did not have functional PVA (either not made or functionality not ascertained) at the time of cross section and were being dialyzed through temporary catheter are included in this analysis of the total cohort. **2:** At the time of collection of data. **3:** Patients were being dialyzed by temporary non cuffed catheter.

Discussion:

Our data on a large number of prevalent HD patients reveals that majority (88.8%) initiated dialysis through a temporary non cuffed double lumen catheter. This has been a persistent finding in loco-regional as well as some international studies[9,10]**.** The factors contributing to this observation likely include delayed presentation and/or referral[11,12] and resistance in acceptance of renal replacement therapy.[13] In our experience, majority of such patients require repeated emergency visits with uremic symptoms and fluid overload ultimately agreeing for placement of temporary vascular catheters (TVC) and hemodialysis. Temporary catheters are convenient to use, however are prone to several complications including thrombosis and infections hence complicating the course of illness leading to delay in VA formation.

"Fistula First" initiative was launched by Centre for Medicare and Medicaid in collaboration with End Stage Renal Disease Networks[14] and was taken up enthusiastically by the nephrology community realizing that it will significantly decrease the morbidity and mortality associated with TVCs. It seems that in some of the developed countries the importance of Fistula First initiative has been realized fully (84% in Japan, 50 - 60% in most of European countries)[15],

whereas some developed countries including USA are still far behind (AVF: 17.1%, AVG: 2.8% at initiation of hemodialysis)[16]. In our study, only 51 (12.9%) patients had an AVF at the time of initiation of dialysis. Among these forty-three (11%) patients initiated RRT through an AVF and in eight (8;1.9%) patients AVF was not yet mature to initiate dialysis. This is a dismal statistic and is comparable to a smaller local study by Nasir SN et al (18.3%). Our local patient dynamics where cost of creation of fistula, denial and fear of dialysis are common factors delaying patient decision. On the other hand, it is encouraging that at the time of cross section 89% (349 patients) were being dialyzed through a permanent vascular access (AVF: 335, AVG: 14).

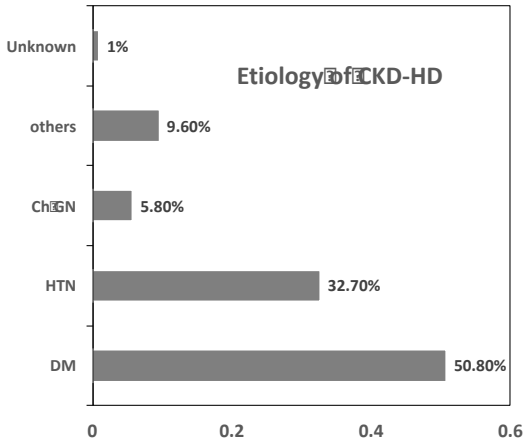

Figure 1: Etiology of underlying kidney disease resulting in CKD-V Hemodialysis in 394 patients.

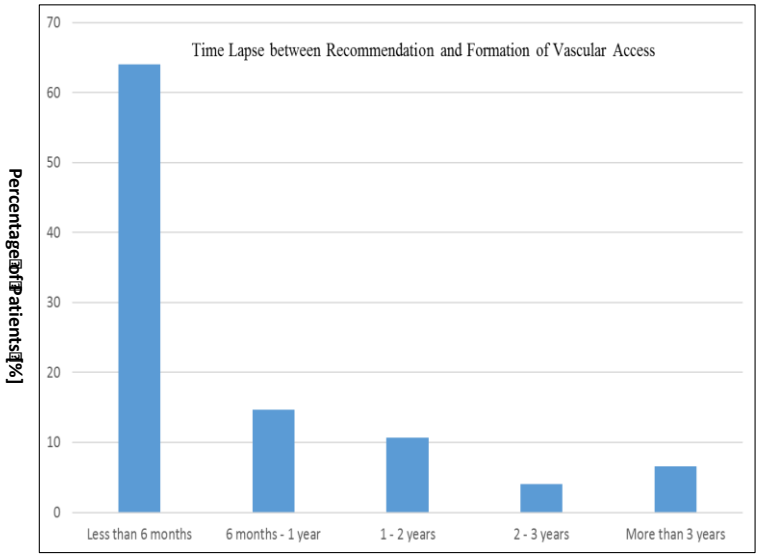

Figure 2: Percentage of patients with time lapse between recommendation by the nephrologist to create permanent vascular access and actual formation of vascular access among 394 patients on hemodialysis.

Over all 335 patients (85%) had an AVF at the time of cross section. Among these, more than half (199; 59.4%) had AVF failure at least once including 80 (24%) who had more than one AVF failures. Waheed D et al[17] in a smaller cohort of 92 patients documented fistula failure in 15.2% only, however ours' multicenter study takes into account

inherent differences of vascular access across different dialysis units in a larger population thus representing ground realities. Shahnawaz et al[18] reports AVF failure rates of 42.3% (n=182) at 6 months similar to our study.

Since AVG is considerably more expensive, it is usually employed as a secondary vascular access after failure of AVF. AVG was the vascular access in fourteen (14/349, 4.0%) at the time of cross section, out of whom twelve (12) patients had AVG as initial vascular access and two (2) had AVG constructed after failure of AVF. Among these patients also 9 (> 50%) required reconstruction of AVG.

As noted in our study time lapse between recommendation and initiation of dialysis correlated weakly but significantly with subsequent failure of vascular access. This may suggest that delayed initiation of dialysis resulted in the continuation of the same vascular factors that cause accelerated atherosclerosis with CKD[19,20,21] and thus may be responsible for failure of vascular accesses after its formation. However, a larger study in a cohort of patients refusing dialysis may be able to identify the plausible factors leading to frequent failure of VA.

Shortcomings of our study include the retrospective nature covering up to 5 years. Although we tried to eliminate recall bias by excluding patients still some of our patients might have had issues in accurately reporting events regarding their vascular accesses.

Conclusion:

Large cohort of dialysis patients are still being initiated on HD by TVCs due to delay in creation of AVF. Achieving the target of Fistula First in a majority of our HD patients still needs a lot of patient education and timely referral by the nephrologists.

Disclosure: None

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