

Audit of Vascular Access Surgery in A Tertiary Care Hospital

Anum Arif, Osama Haadi, Ahsin Manzoor Bhatti, Syed Hashim Ali Syed, Zahid Farooq Baig, Ali Hamza Cheema

Combined Military Hospital (CMH) Medical and Dental College Lahore/National University of Medical Sciences (NUMS) Pakistan

ABSTRACT

Objective: to analyze the outcomes of arteriovenous fistula (AVF) constructed in our setup.

Study Design: Retrospective observational study.

Place and Duration of Study: Combined Military Hospital, Lahore, from Mar 2019 to Mar 2020.

Methodology: Our study included all the patients who had their arteriovenous fistula (AVF) made during the study period. Data was collected via telephone calls, to inquire about the status of AV fistula after one year of AV fistula construction surgery.

Results: Out of 130 study participants, 97 were successfully contacted. Mean age of patients was 54.39 ± 12.75 years. Majority were male patients (71.1%) and had their first dialysis via temporary dialysis access catheter. Most of the patients (74.7%) had functional AVF. 35 (36.1%) patients were not alive at the time of contact. In 9 (9.2%) patients, AV fistula failed with the most common cause being thrombosis (77.7%).

Conclusion: Current study is one of the pioneer in Pakistan where we have started to audit our performance as the dedicated access surgeons. It is high time for us to evaluate our performance so that better outcome can be offered to the dialysis dependent patients.

Keywords: Arteriovenous fistula (AVF), Hemodialysis access, Mortality, Vascular surgery.

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INTRODUCTION

A well-working vascular access is necessary for providing adequate hemodialysis.¹ The vascular route of entry can be of the following types: arteriovenous fistula (AVF), arteriovenous grafts (AVG) and central vein catheter (CVC).¹ Preferred vascular route of access for hemodialysis is the arteriovenous (AV) fistula.² It is associated with higher blood flow, and lesser chances of thrombosis, sepsis and stenosis.³⁻⁵

It has been well postulated that early referral by a nephrologist to the microvascular surgeon moderates the requirement for temporary dialysis access for first dialysis and increases the rate of successful AVF placement.¹ However, there are unavoidable situations when a temporary central venous catheter mandates for an urgent dialysis but at the cost of infection, thrombosis, venous stenosis and damage to the proximal vessels.¹

After the construction of AV fistula, patient is advised to wait for up to 6 weeks to allow the AV fistula obtain adequate dilation allowing appropriate hemodialysis.⁶ AV fistula that never matures to the point that it could allow hemodialysis is termed as

early AV fistula failure. AV fistula that fails after 3 months of its successful functioning is called late AV fistula failure.^{7,8}

It is well documented in literature that 20-40% AV fistulas never mature or did not allow adequate hemodialysis.⁶ A study in Nigeria concluded that 7.5% of AV fistula ended in failure.⁹ Another systemic review on fistula outcomes, reported the median rate of AV fistula outcomes and the median rate of various events that led to AV fistula failure. According to that systemic review, median rate of total infections was 0.11 infections per 1000 patient days. The median thrombosis rate was 0.24 events per 1000 patient days. Median incident rate of steal syndrome was 0.05 events per 1000 patient days. Good post-operational AV fistula care is associated with lower rates of AV fistula failures.¹⁰

There is a definite scarcity of dialysis related national data of Pakistan. The aim of this study was to study the outcomes of AV fistula after they were constructed and to find the number of AV fistulas that failed to mature and to find the cause behind failure of AV fistulas. We analyzed the outcomes of AVF constructed in our setup so that we can evaluate our local trends and devise national reforms regarding dialysis.

Correspondence: Dr Anum Arif, Department of Vascular Surgery, Combined Military Hospital Lahore Pakistan
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METHODOLOGY

A retrospective observational study was conducted at a Tertiary Health Care Hospital of Pakistan from March 2019 to March 2020 after getting ethics approval from the hospital (IRB#25 /Estb/ACC).

Inclusion Criteria: Our study included all the patients who had their AV fistula made during the study period.

Exclusion Criteria: Patients with bisalic vein transposition and secondary procedure like arteriovenous grafting were excluded.

Non-probability convenient sampling technique was used. Sample size was calculated by taking 95% confidence interval and 5% margin of error.¹ All the surgeries were done by a single vascular surgeon and similar end to side anastomotic technique was utilized in all the cases. Data was collected via telephone calls to inquire about the status of AV fistula after one year of AV fistula construction surgery. After taking informed consent from the patients, they were asked a list of questions that had two parts. First part included questions about their demographics, gender and comorbid conditions. Second part of the question list had questions regarding site of AV fistula, surgical technique use, previous history of AV fistula construction, if there was any dialysis line before AV fistula creation. Questions were further asked about the present AV fistula that if it was working correctly and the probable reason behind AV fistula failure.

Data was analysed by using Statistical Package for Social Sciences (SPSS) version 23. Mean and standard deviation were calculated for qualitative variables. Frequency and percentage were calculated for quantitative variables. Chi-square test was applied and the p-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 130 hemodialysis access were made in the study duration. Out of 130 study participants, 97 were successfully contacted. Majority were male patients 69 (71.1 %) as shown in Table-I. Mean age of the patients was 54.39 ± 12.75 years. Most of the patients 92 (94.8%) had their first dialysis with a temporary dialysis access.

Table-I: Outcomes of arteriovenous fistula (n=97).

Outcomes of Arteriovenous Fistula	n (%)
Type of Arteriovenous Fistula	
Radio Cephalic	28 (28.8)
Brachio Cephalic	(69.9)
Current status of Arteriovenous Fistula	
Functional	56 (74.7)
Non functional	
Died before fistula became functional	12 (16) (9.3)
Causes of Arteriovenous Fistula Failure	
Infection	1 (11.1)
Pseudo aneurysm rupture	1 (11.1)
Thrombosis	7 (77.7)
Steal Syndrome	-
Neuropathy	-

Table-II showed the factors affecting the outcomes of AVF. Most of the patients (74.7%) had

Table-II: Factors affecting outcome and complications of arteriovenous fistula (n=97).

Parameters	Status of Arteriovenous Fistula, n (%)			p-value		
	Functional	Non-Functional	Died before fistula was functional			
Gender						
Male	43 (82.6)	4 (7.6)	5 (9.6)	0.012		
Female	13 (25)	8 (15)	2 (3.8)			
Type of Arteriovenous fistula						
Brachiocephalic	38 (50.6)	8 (10.6)	7 (9.3)	0.54		
Radiocephalic	18 (24)	4 (5.3)	-			
Previous Dialysis Line						
Yes	53 (74.6)	12 (16.9)	6 (8.4)	0.40		
No	3 (5.7)	-	1 (2.5)			
Parameters	Complication of Arteriovenous Fistula, n (%)					p-value
	Infection	Rupture	Thrombosis	Neuropathy	Steal Syndrome	
Gender						
Male	-	-	3/9 (33.3)	-	-	0.04
Female	1/9 (11.1)	1/9 (44.4)	4/9 (44.4)	-	-	
Type of Arteriovenous Fistula						
Brachiocephalic	1/9 (11.1)	1/9 (11.1)	3/9 (33.3)	-	-	0.134
Radiocephalic	-	-	4/9 (44.4)	-	-	
Previous Dialysis Line						
Yes	1/9 (11.1)	1/9 (11.1)	7/9 (77.7)	-	-	0.91
No	-	-	-	-	-	

functional AVF. 35 (36.1%) patients were not alive at the time of contact. The factors associated with AVF complications were shown in Table-II. In 9 (9.2%) patients, AV fistula failed with the most common cause being thrombosis (77.7%). Figure-1 showed the relationship between dialysis line and mortality. Relationship between arterio-venous fistula and mortality was shown in Figure-2. Relationship between history of previous dialysis line and later creation of arterio-venous fistula with mortality was shown in Figure-3.

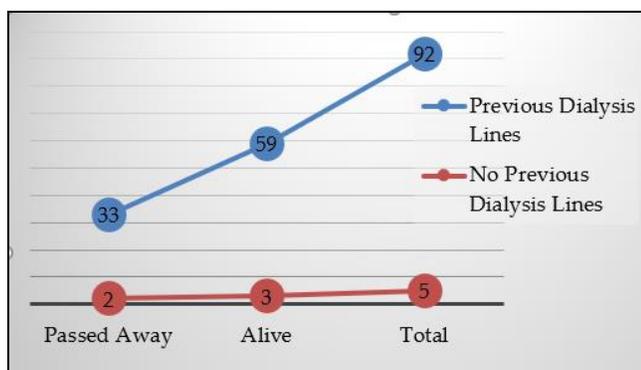


Figure-1: Relationship between dialysis line and mortality.

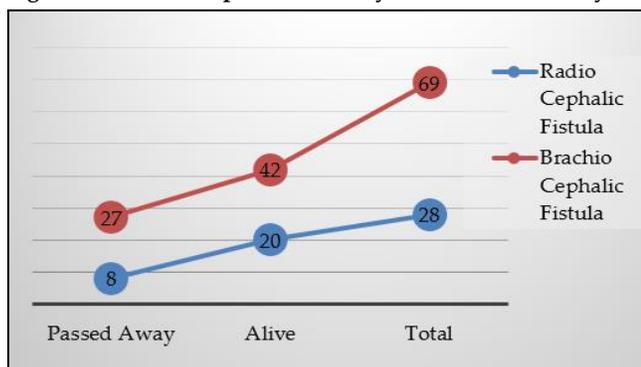


Figure-2: Relationship between arteriovenous fistula and mortality.

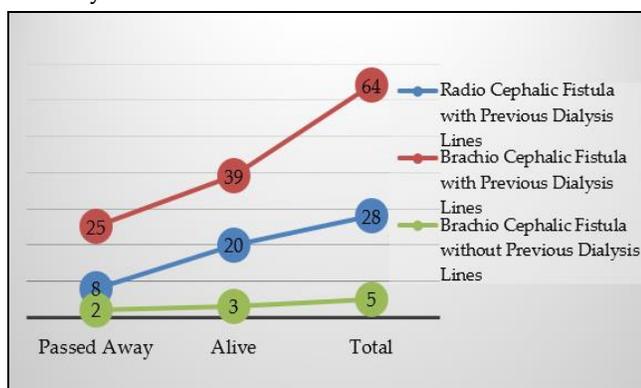


Figure-3: Relationship between history of previous dialysis line and later creation of arteriovenous fistula with mortality.

DISCUSSION

Number of end-stage renal disease patients requiring hemodialysis, is increasing all across the world.^{11,12} According to a study published in 2010, 114083 individuals residing in United States of America initiated hemodialysis and 91% chose hemodialysis as the preferred type of dialysis.¹³ Another study stated that approximately 86% of the Chinese dialysis population underwent hemodialysis.¹² In Pakistan the cost of dialysis per patient per year is \$3,000, which is about eight times the average annual per capita income of the country.³ The incidence of disease in Pakistan is 100 per million population a year.¹⁴

The present study showed that majority of the AVF were made for the male patients, which was similar to previous literature. A meta-analysis showed that there was male predominance of 66% in USA, 67% in Japan and 73% in European population.¹⁵

In present study, majority of the females had brachiocephalic fistula that has greater diameter than then radiocephalic AVF. We also found that, 66.6% fistula failed to mature in female participants, similar to other studies in literature most likely, due to difference in vascular reactivity and platelet aggregation after vascular injury or diminished ability of vein to dilate due to arterial pressure.^{15,16}

Most commonly created AVF was brachiocephalic fistula on left arm due to right arm dominance that was comparable to recent study in Sudan (78.1%).¹⁷ It is contrary to Salako *et al*, in a recent study conducted in Nigeria were 18.8% patients had brachiocephalic fistula.⁹

The process of AVF maturation is complex and multifactorial with a well-documented failure rate of 28-53%.⁶ In present study 12.3% access failed to mature which was comparable to the finding of Salako *et al*.⁹ On the other hand, Asif *et al*, showed that 36% of the AVF failed to mature.⁶

Most common cause of AVF failure reported in literature, is thrombosis which was similarly seen in our study. The current KDOQI guidelines endorse that center-specific thrombosis rate for the fistula should not exceed 0.25 events per patient year (0.69 per 1000 patient days).^{17,18} Our results were encouraging by the fact that, rate of thrombosis was less than most of the international studies where rate of thrombosis was 10% and 20% respectively.¹⁹ In our study, all the patients had temporary dialysis lines. Only 1 patient deve-

loped failure to attain primary patency due to the infection which was comparable the previous study.²⁰

There is a distinct lack of national data on dialysis in Pakistan. We conducted this study to investigate the outcomes of AV fistulas, as well as the number of AV fistulas that failed to mature and the causes of AV fistula failure. We analyzed the outcomes of AVF constructed in our setup so that we can evaluate our local trends and devise national reforms regarding dialysis.

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CONCLUSION

Current study is one of the pioneers in Pakistan where we have started to audit our performance as a dedicated access surgeon where high volume of hemodialysis access surgical patients are being referred by nephrologist and urologist. It is high time for us to evaluate our performance so that better outcome can be offered to the dialysis dependent patients.

Conflict of Interest: None.

Authors' Contribution

AA: Conceived, designed, did data collection, statistical analysis, and manuscript writing, OH: Did data collection and assortment, AMB: Conceived, designed, final editing, and approval, SHAS: Did the review editing, revising critically, ZFB: Did the review, editing revising critically, and final approval of the manuscript, AHC: Did data collection and assortment, AHC: Data Data collection.

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