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Research Article

A Study of Arteriovenous Fistula Failure in Haemodialysis Patients

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Abstract: Fistula failure is frequent cause of increased mortality ,morbidity ,psychological and financial burden in End Stage Renal Disease(ESRD) patients who are on hemodialysis (HD) for survival in developing countries where renal transplants is not affordable by common people. There are multiple factors leading tofailure of arteriovenous fistula (AVF) in these patients like diabetes,atherosclerosis and out of these technical errors, hypotension, site of insertion, infection of fistula are the common preventable causes of failure. 244patients underwent dialysis from May 2005 to April 2013 for end stage renal disease and 55 patients (22.5%) never got AVF done for various reasons and therefore 189 patients (77.5%) with 224 AVF studied. In addition to underlying disease such as diabetes mellitus other factors such as hypotension ,infection gender,site, side differences recorded when AVF failed. Total of 189 (77.5%) patients, males constituted (79%), Non -DM (64.6%) A total of AVF 224 performed on 189 patients. and 77% of AVF were done on left hand and radial was predominant (55%).AVF failure was more in males (68.5%) compared to females(31.5%)and Non-DM (66%) had failures than diabetes(34%)because of the larger representation .AVF done on left (86%) failed as more number of fistula were on the that side. Similarly (80%) of radials failed.25 percent failed primarily (before dialysis) commonly due to drop in blood pressure and infections and improper selection of vessel for AVF and among the remaining 75%, 50% patients had functional AVF for at least 24 months and 25% of them 13 months functioned and then failed mainly due to hypotension during hemodialysis and recurrent failures were vessel thrombosis, technical difficulty.

Keywords: AVF, CKD, DM, ESRD, Hemodialysis

INTRODUCTION

The prevalence of fistulas among hemodialysis patients reflects both national, regional, and local practice differences as well as patient-specific demographic and clinical factors. Increasing fistula prevalence requires increasing fistula placement, improving maturation of new fistulas, and enhancing long-term patency of mature fistulas for dialysis [1]. Whether a patient receives a fistula depends on several factors: timing of referral for dialysis and vascular access, type of fistula placed, patient demographics, preference of the nephrologist, surgeon, and dialysis nurses, and vascular anatomy of the patient. Whether the placed fistula is useable for dialysis depends on additional factors, including adequacy of vessels, surgeon's experience, patient demographics, nursing skills, minimal acceptable dialysis blood flow, and attempts to revise immature fistulas. Whether a mature fistula achieves long-term patency depends on the ability to prevent and correct thrombosis. An optimal outcome is likely when there is (a) a multidisciplinary team approach to vascular access; (b) consensus about the goals among all interested parties (nephrologists, surgeons, radiologists, dialysis nurses, and patients); (c) early referral for placement of vascular access; (d) restriction of vascular access procedures to surgeons with demonstrable interest and experience; (e) routine, preoperative mapping of the patient's arteries and veins; (f) close, ongoing communication among the involved parties; and (g) prospective tracking of outcomes with continuous quality assessment. Implementing these measures is likely to increase the prevalence of fistulas in any given dialysis unit. However, differences among dialysis units are likely to persist because of differences in gender, race, and co-morbidity mix of the patient population [2-4].

METHODOLOGY

In this prospective study a total of 244 ESRD patients who underwent dialysis from May 2005 to April 2013 in SN Medical college &HSK hospital but only 189 patients were considered and observed for fistula failure as 55 of them were on catheter and never got an AVF because of various reasons and were excluded. In addition to demographic profile and underlying disease such as diabetes mellitus, other factors such as hypotension, infection, gender, site, side

difference and number of fistulas failed were also recorded .

Statistical analysis done using open EPI software version 2.3.1 chi square test applied to see the differences between two proportions.

RESULTS

Table1 indicates detailed demographic profile of last 9 years in dialysis unit. A total of 244 patients were dialysed, 55 (22.5%) did not get a AVF and total of 189 (77.5%) patients were included and studied. Males constituted (79%). We had more Non -DM (64.6%) being dialysed, however last 2 years gradual increase in DM noted. About 77% of AVF were done on left hand and radial was predominant (55%).

AVF failure was slightly more in 24 males (68.5%) compared to11 females (31.5%). But % AVF failure was more in females (27.5%) compared to males (16%) as in table 3.

Non- DM (66%) had failures than diabetes (34%). AVF done on left (86%) failed as more number of fistula were on that side. Similarly (80%) of radials were failed.

Interestingly % AVF failure in brachial artery (7%) was lesser than that of radial artery (22.8%) which is statistically significant.

Table 1: Demographic profile of dialysis with224AVF patients

May-April	Total patients	male	female	DM	Non-DM	brachial	radial	Left hand	Right hand	DLC
“05-“06	32	20	8	8	20	17	15	22	8	4
“06-“07	20	10	7	2	15	8	12	15	7	3
“07-“08	23	15	3	3	15	11	14	16	8	5
“08-“09	39	26	4	11	19	16	19	30	4	9
“09-”10	27	12	2	7	7	7	11	16	4	13
“10-“11	30	18	4	6	16	12	14	21	5	8
“11-“12	44	28	7	19	16	18	20	30	9	9
“12-“13	29	20	5	11	14	12	18	22	7	4
	244	149 (79%)	40 (31%)	67 (35%)	122 (65%)	101 (45%)	123 (55%)	172 (78%)	52 (22%)	55 (21.%)

Table 2: Demographic profile in 35 AVF failure patients

	Male	Female	DM	Non DM	Brachial	Radial	L hand	R hand
"05-"06	5	1	1	5	1	5	5	1
"06-"07	4	1	2	3	2	3	5	0
"07-"08	4	1	1	4	0	5	4	1
"08-"09	3	3	3	3	0	6	4	2
"09-"10	2	2	1	3	1	3	3	1
"10-"11	2	1	2	1	0	3	3	0
"11-"12	3	1	1	3	2	2	4	0
"12-"13	1	1	1	1	1	1	2	0
	24	11	12	23	7	28	30	5

Table 3: Percentage of AVF failure

	Failed AVF		NO failure		Total	X2	p
	Number	%	Number	%			
M	24	16	125	84	149	2.71	0.04
F	11	27.5	29	72.5	40		
DM	12	18	55	82	67	0.02	0.43
NON	23	19	99	81	122		
BRAC	7	7	94	93	101	10.55	.0005
RAD	28	22.8	95	77.2	123		
LH	30	17.5	142	82.5	172	1.85	0.08
RH	5	10	47	90	52		

DISCUSSION

More than 65% of patients of chronic kidney disease (CKD) present as end-stage renal disease (ESRD) to a nephrologist in India thus making it difficult for any systematic planning for ESRD care in stage IV of CKD.[5] Thus, except for a small number of patients who may have planned for ESRD care earlier, almost all ESRD patients require immediate/urgent dialysis, necessitating central venous catheterization for emergency vascular access.[6]

In all years male predominance in ESRD seen, year wise recorded with M:F:79:21,which is similar to [7] study of M:F ratio of 70:30.Although, more males had failed AVF, AVF failure was more in females (27.5%) compared to males(16%) this was statistically significant which can be explained by anatomically well developed vessels in males compared to their counterparts.

Most patients on dialysis were nondiabetes(64.6%)) compared to diabetes(35.4%) till 2010,though DM is the major cause for nephropathy. Probably in our study we had more nondiabetics seeking dialysis.But from 2011 there is increase in number of diabetes on dialysis.

Our study (table 3) also supports that brachial artery fistula are more patent with % failure of 7%,compared to radial with 22.8%,radialartery are more preferred for below reasons.

Out of total 224 (100%) AVF done,most preferred site for anastomosis by surgeon is radial artery (55%) in majority of patients unless anatomically unfit, followed by brachial AVF(45%) all years. Brachial artery is not for preferred primary anastomosis out of fear of provoking hypercirculation and cardiac decompensation.,but can be minimised using newer surgical techniques [8].

Upper limbs are the gold standard for frequent dialysis in CRF cases especially distal fistula are more common because this creates more superficial venous & less complication in comparison with proximal fistula when greater & major arteries are used.[9]Consequently despite the risk of failure distal type fistulas implantation of distal fistulas in upper limbs is our first choice except in cases where distal thrombosed vessels it cannot be performed [10].

Most preferred and chosen hand by performing surgeon is left hand (64..6%) and only 35.4% on the right .Left hand is more chosen because it is less used for heavy works ,less chances of injury to AVF.

Table 2 shows, AVF failure rates from 2005-2013, recent years show there is decline in overall failure rates from as high as17% to 6-11 %in 2012-13. AVF failure was slightly more in males and non diabetes compared to females and DM respectively; this could be because of larger representation. AVF done on left (86%) failed as more number of fistula were on that side. Similarly, 80% of radials failed.

Table 4: Comparision of AVF failure

Study	Primary	Secondary	
Pak [11]	30%	70%	47% (20 months)
			23% (7.5 months)
Present	25%	75%	50% (24 months)
			25% (13 months)

Table 4 shows our study has 25% of all operations led to primary failure (before initiation of dialysis)compared with similar study with 30% failures. Out of remaining 75% about, 50% AVF were functional for 2 years and then failed. 25% functioned up to 13 months similar to Pakistan study [11]. Recurrent AVF were once failed 19%, twice 3%, many 2 % .Further calculations not possible because of patient loss, Maximum years of follow up was 13 years on HD with 4 AVF failures.

In AVF failure cases falling blood pressure and diabetes & arterial atherosclerosis were reported in 75% and 25% respectively .In addition other reasons for failure were positive history of CVA and IHD and higher age and dependency to dialysis during surgery [12].

Our study is not to comment on the surgical aspect, although two main reasons for failure of AVF are the surgeons inexperience and improperly selected vessels contributing to both primary and secondary cause of AVF failures we would say, with the microscopic vascular surgery & new technologies less complications and higher success rate or even higher probability of fistula repair possible [13].

In country like ours where there are no insurance policies for mainatainence dialysis, economic constraints repeated AVF failures are an additional burden for the care takers and patients for catherisation, AVF, AV grafts.

In recent years may factors have contributed to decrease in AVF failure rates from 2011 onwards in our study, also better fistula care, insertion of AVF needles away from anastomosis, good selection of vessels, operative skills and patient education has delayed AVF failures.

High dose administration of heparin using bigger venous, mean blood pressure of 8mmHg or higher, alongside with appropriate technique and ideal operating systems were major etiologies for success rate. Although duplex ultra sonographic study is suggested for advanced evaluations of diabetic elderly and patients with peripheral vascular disease[14] may not be feasible for all.

In our study major reason for AVF failure (primary and secondary) was fall in blood pressure (25%, 75% respectively). Besides any factor that led to blood pressure changes increased this, as a consequence the most important factor along with good vascular selection is stable blood pressure (100/80mmHg). Raised blood pressure, in addition to other complications of hypertension, increases the risk of bleeding in the fistula site and AVF failure. On the other hand hypotension would lead to AVF failure because of thrombosis [15].

In our country, where there are no insurance policies for mainatainence dialysis, economic constraints repeated AVF failures are an additional burden for the care takers and patients for catheterisation, AVF, AV grafts.

Finally, it is suggested that in patients who require AVF implantation for dialysis, adequate blood pressure control with anti hypertensives and low salt diet, proper care AVF infection limits failures and reduces the psychological and financial burden.

Recommendations:

We recommend few guidelines to reduce AVF failures in dialysis patients

1. For surgeons: A portion of surgeons to be trained to gain expertise in performing only AVF .
2. Doppler study to performed for proper selection of blood vessels. Use of anti-platelet drugs in high risk patients for good results by preventing in situ thrombosis
3. Dialysis technician: play a vital role in proper functioning of AVF by regular monitoring of AVF for hypotension which a major cause for the failure, to refer for AVF repair if flow rate decreases, to avoid using tight tourniquet after dialysis.
4. Treating physician :motivate patients for elective AVF during follow up ,specially diabetic nephropathy. To avoid multiple iv canulas and pricks on the left hand.
5. Patients; To avoid weight bearing in fistula hand, prevention of wound infection by antibiotics and dressing, should report to doctor if the thrill decreases by palpating it and to mild exercises like squeezing of rubber ball for maturation of AVF

REFERENCES

1. Allon M, Robbin ML; Increasing arteriovenous fistulas in hemodialysis patients: problems and solutions. Kidney Int., 2002; 62(4): 1109-1124.
2. Pisoni RL, Young EW, Dykstra DM, Greenwood RN, Hecking E, Gillespie B *et al*.; Vascular access use in Europe and the United States: Results from the DOPPS. Kidney Int., 2002; 61: 305–316.
3. NKF-DOQI Clinical Practice Guidelines for Vascular Access. New York, National Kidney Foundation, 1997.
4. Konner K; Primary vascular access in diabetic patients: An audit. Nephrol Dial Transplant., 2000; 15: 1317–1325.
5. Townsend CM, Beauchamp RD, Evers BM, Mattox KL; Sabiston Textbook of Surgery. 16th edition, Philadelphia; Saunders Company, 2001: 1450-1462.
6. Kher V; Tunneled CVC for dialysis: Aneccessary evil? Indian J Nephrol., 2011; 21(4): 221–222.
7. Rajapurkar MM, John GT, Kirpalani AL, Abraham G, Agarwal SK, Almeida AF *et al*.; What do we know in chronic kidney disease in India: first report of the Indian CKD registry. BMC Nephrology, 2012; 13 :10
8. Konner K, Nonnast-Daniel B, Ritz E; The arteriovenous fistula. J Am Soc Nephrol., 2003; 14: 1669–1680.
9. Kim YO, Yang CW, Yoon SA, Chun KA, Kim NI, Park JS *et al*.; Access blood flow as a predictor of early failure of native arteriovenous fistula in hemodialy- sis patients. Am J Nephrol., 2001; 21(3): 221-225.
10. Schwab SJ, Oliver MJ, Suhocki P, McCann R; Hemodialysis arteriovenous access: detection of stenosis and response to treatment by vascular access blood flow. Kidney Int., 2001; 59(1): 358-362.
11. Talaiezadeh AH, Askarpour S, Paziar F; Factors responsible for fistula failure in hemodialysis patients .Pak J Med Sci., 2006; 22 (4): 451-453.
12. Cavalloro G, Taranto F, Cavalloro E, Quatra F; Vas cular complications of native arteriovenous fistulas for hemodialysis; role of microsurgery. Micro Surg., 2000; 20(5): 252-254.
13. Sheth RD, Brandt ML, Brewer ED, Nuchtern JG, Kale AS, Goldstein SL; Permanent hemodialysis vascular access survival in children and adolescents with end- stage renal disease. Kidney Int., 2002; 62(5):1864-1869.
14. Malovrh M; Approach to patients with end-stage re nal disease who need an arteriovenous fistula. Nephrol Dial Transplant., 2003; 18 (suppl 5): 50-52.
15. Miller PE, Tolwani A, Luscy CP, Deierhoi MH, Bailey R, Redden DT *et al*.; Predictors of adequacy of arterio- venous fistulas in hemodialysis patients. Kidney Int., 1999; 56(1): 275-280.