ORIGINAL ARTICLE

EARLY VERSUS LATE ARTERIO-VENOUS FISTULAE: IMPACT ON FAILURE RATE

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Background: Haemodialysis is the primary mode of renal replacement therapy for patients of end stage renal disease. The most important determinant for effective haemodialysis is a reliable vascular access. Arterio-venous (AV) fistula is the closest to be an ideal long-term haemodialysis vascular access. The creation of fistulas or grafts is recommended before starting haemodialysis, this study was undertaken to determine the impact of timing of AV fistula creation on its failure rate. **Methods**: It is a descriptive study. All patients with chronic kidney disease (CKD) reporting to Armed Forces Institute of Urology (AFIU) and Military Hospital (MH) Rawalpindi from January 2008 to October 2009 in whom vascular access was created were included. The patients were followed prospectively and a complete data about their haemodialysis and vascular access was maintained. **Results**: A total of 168 permanent accesses were created in 112 patients in this study. The mean duration of follow-up was 14.05±4.45 months. Early access creation group included 23 patients and late access creation group included 89 patients. Out of 168 fistulas that were created, 54 fistulas failed with 45 (83.3%) of these from patients of late access creation group. Age, gender and diabetes mellitus (DM) had no significant affect on failure rate of fistulas. **Conclusion**: Timely referral to nephrologists and early creation of permanent vascular access by dedicated team work can improve the success rate of AV fistulae so enhancing quality of life of patients of end stage renal disease.

Keywords: Nephrology consultation, Haemodialysis, Arterio-venous fistula

INTRODUCTION

Early pre-dialysis nephrology care is essential in patients with chronic kidney disease, as it has shown to slow the progression of kidney disease and reduce morbidity and mortality.[1–6] One of the most important aspects of pre-dialysis care is the timely creation of vascular access. National Kidney Foundation Kidney Disease Outcome Quality Initiative (KDOQI) guidelines recommend that vascular access should be created when a patient's creatinine clearance is less than 25 ml/min, or when their serum creatinine is greater than 4 mg/dl (353 μmol/L), or within 1 yr of expected start of haemodialysis.[7] Another target set by these guidelines is that fistulas should be created at least 3–4 months before use. Despite these recommendations, even in developed countries approximately one third of persons starting chronic haemodialysis therapy are referred late for pre-dialysis care, and between 30–60% use a double lumen catheter as their initial vascular access.[8,9] Use of double lumen catheters for haemodialysis is a consistent risk factor for sepsis.[10,11]

The situation in Pakistan is even worse, most of the patients are referred late to nephrologists and even those who are under nephrologists care are unwilling for AV access creation.[12] So AV fistulae in majority of cases are created after institution of haemodialysis. The objective of this study was to determine the impact of timing of AV fistula creation on its maturation and failure.

PATIENTS AND METHOD

This is a descriptive study conducted in prospective design, in patients with chronic kidney disease (CKD) in whom permanent vascular access was created. All patients reporting to nephrology out patient department or emergency reception of Armed forces Institute of Urology (AFIU) and Military Hospital (MH) Rawalpindi from January 2008 to July 2009 were included in this study. After a thorough history, complete physical examination and investigations, the patients were treated depending on their condition and then referred for vascular access creation. As per protocol the patients with chronic kidney disease were referred for vascular access creation as early as possible after stabilisation of their condition. The patients presenting acutely were biopsy confirmed or followed up for three months before referring them for vascular access creation. A complete data about their haemodialysis and vascular access was maintained. This included their demographic information, likely cause of CKD, details about haemodialysis and vascular access. Vascular access information included its site of formation, time relation to haemodialysis and details of surgeon.

For AV fistula formation patient were examined clinically regarding condition of his vessels and in doubtful cases Doppler ultrasound mapping was carried out. End-to-side anastomosis was carried out and patency checked clinically by thrill. The fistula was examined next day for patency clinically. In doubtful cases Doppler ultrasound was carried out and fistula

reopened in case of failure. Fistulas were allowed to mature for more than 4–6 weeks before use and cannulated when considered fit after examination. Radio cephalic (wrist) fistula is the preferred site followed by brachio-cephalic (elbow) fistula. In the absence of suitable vessels or after failure of fistulas at these sites, brachio-basilic fistula with anterior transposition of vein was preferred over prosthetic graft. Local anaesthesia was used for conventional fistulas while Brachio-basilic fistulas and prosthetic grafts were done under general anaesthesia.

A fistula was considered to have had a primary failure when it never matured adequately to be used successfully for dialysis. The fistulae were categorized as early if created more than one month before institution of haemodialysis and late if it was formed within one month before or after starting haemodialysis. The outcome of the study was defined as successful use of fistula for haemodialysis after maturation. Based on early and late access creation, patients were divided into 2 groups. After comparison of demographic features, the rate of failure was compared between two groups.

RESULTS

In this study, 125 patients with CKD in whom vascular access was created, were included. Out of these 5 patients were lost during follow-up and the rest 114 patients were followed prospectively. Eight patients died during study period, so a total of 112 patients were included in this study with a mean duration of follow-up of 14.05±4.45 months.

A total of 168 permanent accesses were created in these 112 patients. Out of these 68.8% had received one permanent access, 18.8% received two and 12.5% received three or more permanent access. Early access creation group (E-group) included 23 patients and late creation group (L-group) included 89 patients. Patients in L-group were relatively younger as compared to E-group. Males outnumbered females in both groups with over 60% males in both groups (p=0.36). There were more patients with diabetes mellitus (DM) in E-group as compared to L-group (p=0.557) (Table-1).

Time of nephrology consultation varied a lot with majority of patients of E-group reporting to a nephrologist 4 months or earlier to start of haemodialysis (p<0.001). In L-group 46% cases reported to nephrologist at the initiation of haemodialysis or less than one month prior to haemodialysis and 36 % cases more than 4 months prior to starting haemodialysis (Table-1).

The majority of patients had a permanent access created just before or after starting haemodialysis (62.5%), creating a bell shaped distribution when plotting persons in monthly interval (Figure-1). Double-lumen temporary catheter (DL) use increased when access was created late relative to start of haemodialysis or in patients with multiple fistulae failure (p<0.001). First haemodialysis through a double lumen catheter was carried out in 31% patients from E-group and 98% patients of the L-group (p<0.001). The mean time of use of DL catheter in patients starting haemodialysis without permanent vascular access was 8.3 weeks (58 days). The mean time between referral to surgeon and first access creation was 2.47 weeks (17 days). Most of the vascular access operators were urologists in our setup, followed by vascular surgeons. Time between AVF creation and cannulation is more than 4 weeks, with 20.5% cases having cannulation after 4 weeks, 45.5% after 5 weeks and 34% after 6 or more weeks.

Out of 168 fistulae that were created 54 fistulas failed, with significant proportion of these i.e. 83.3% (n=45) from patients of L-group (p-value 0.005). Age, gender and DM had no significant affect on failure rate of fistulas. Radio-cephalic site was the major site of failed fistulae with over 85% of failed fistulas from this site, followed by brachio-cephalic fistulae. Primary failure due to thrombosis was the commonest cause (83%), followed by secondary thrombosis and infection of AV fistulas. The major site of working fistulae was also Radiocephalic site (50%) followed by Brachio-cephalic (36.6%).

Figure-2 shows a young patient from L-group who had multiple AV fistulae failed and also had a failed Prosthetic graft. He had multiple life threatening episodes of septicaemia. Presently he is on haemodialysis through right brachio-cephalic fistula and is being worked up for renal transplantation.

Table-1: Comparison of early and late access creation groups

Variables	Early access creation group (n=23)	Late access creation group (n=89)
Age (Yr), (Mean±SD)	51.2±18.058	46.2±16.958
Gender (Male:Female)	40:60	33:67
Cause of ESRD (DM:ND)	52:48	24:76
Time of Nephrology consultation		
<1 month	Nil	46%
1–4 months	8.6%	18%
>4 months	91.4%	36%
1st haemodialysis through DL	31%	98%

ESRD=end stage renal disease, DM:ND=diabetics:non-diabetics, DL=double-lumen

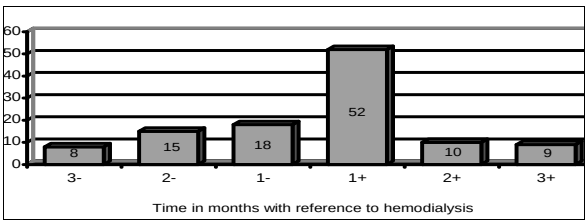

Figure-1: Time of formation of AV fistulas with reference to starting haemodialysis

Figure-2: Multiple failed AV fistulae and a failed prosthetic graft

DISCUSSION

Only 23.5% of patients included in our study had permanent access created early before starting haemodialysis. More age in patients of E-group is likely due to different causes of CKD in two groups. The patients suffering from chronic diseases like diabetes and hypertension get an early nephrologist care due to slow progression of kidney disease and are in E-group, while in late access creation group we have more patients with diseases presenting acutely like glomerulonephritis. This observation is supported in our data with DM more common in E-group. Male predominance can likely be due to entitlement in our setup.

In our study 47% cases had early nephrologists care which in comparison to other countries is very low, i.e., 60–79% patients seeing a nephrologists >4 months before haemodialysis and 69–88% seeing nephrologists >1 month before starting dialysis.[13] Time of nephrology consultation is an important factor and had significant impact on vascular access creation and failure. But even in late access creation group in our study 36% of patients had an early nephrology consultation but in them fistula was formed late. The reasons in these patients are varied and include poor education status, low income to support future haemodialysis, haemodialysis phobia and wrong claims of quacks and non-conventional practicing physicians to remain dialysis free with their treatment. So despite thorough counselling these patients are unwilling to get vascular access created. As a result of this most of the vascular access created is just before or after haemodialysis and majority of patients (81.3%) had first haemodialysis through double lumen. In comparison for patients having seen a nephrologist >4 months prior to ESRD onset, catheter use varied from 10% in Japan to around 50% in Canada, USA and UK.[13]

Time of referral to surgeon and time taken by surgeon for access creation also has impact on likelihood of starting haemodialysis through catheter and thus fistula failure. With lesser time there is more possibility of starting haemodialysis through AV fistula. The mean time from referral to vascular access creation is 17 days in our study and in other countries median time calculated varies from 5 to 6 days in Italy, Japan and Germany, and from 40 to 43 days in Canada and UK.[13]

Time between AVF creation and cannulation in our setup is more than 4 weeks as in most countries. In a few countries, a high proportion of units (>60%) have their AVF first cannulated within 4 weeks after AVF creation.[13]

CONCLUSION

The creation of vascular access and its maintenance will remain a challenge in nephrology. Timely referral to nephrologists and early creation of permanent vascular access by dedicated team work and development of expertise can improve success rate of AV fistula and so improving quality of life of patients with end stage renal disease. Whenever possible AV fistula should be created at least 4 months before starting haemodialysis.

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