



ORIGINAL ARTICLE

Arteriovenous fistula outcomes in terms of one year patency rate and complications.

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ABSTRACT... Objective: To determine functional outcomes of arteriovenous fistula, its complications and patency rate for one year. **Study design:** Cross Sectional study. **Setting:** Department of Urology and Kidney Transplantation Pir Abdul Qadir Institute of Medical Sciences Gambat. **Period:** January 2020 to December 2020. **Material & Methods:** Patients with Chronic renal failure were selected using non-probability consecutive sampling technique. Patients candidate for CBRC arteriovenous fistula at wrist were selected and those requiring other vascular access were excluded from the study. Arteriovenous fistula were made by standard method and its function and patency rate was assessed for one year duration. Patients of both gender and any age were included. **Results:** Total 220 cases were enrolled into the study comprising on 57.3% male and 42.7% female cases. Mean age of patients was 59.4 ± 9.7 years. Most common arteriovenous fistula were radio cephalic in 61.8% cases. Fistula failure in first month was seen in 12.7% cases. Fistula patency rate was 79.1% after three months, 69% after six months and one year patency rate was 61.3%. Most common cause of chronic renal failure was diabetes mellitus in cases. Most common fistula related complication was infection and burst fistula in cases. **Conclusion:** First six months after fistula formation are critical as one third fistula fail during this period. Most common risk factor of fistula failure is diabetes mellitus. Fistula failure was more common among women than men.

Key words: Arteriovenous Fistula, Chronic Renal Failure, Fistula Failure, Fistula Patency Rate, Hemodialysis.

INTRODUCTION

Chronic renal failure is much prevalent disease in our community.¹ Patients with CRF require hemodialysis repeatedly. A proper vascular access for maintenance hemodialysis is necessary.² Arteriovenous fistula formation for hemodialysis was started in 20th century.³ In 1950's Quinton-Scribner silastic Teflon shunt were used and thrombosis, infection and spontaneous dislocation of shunt were major complications reported that time.⁴ Due to these issues in 1966, Hurlwith, Cimino and Brescia surgically made first arteriovenous fistula at the wrist level.⁵ Now AV fistula is necessary in every patient on maintenance hemodialysis. According to a report in the United States prevalence of AV fistula formation has increased from 33% in 2003 to 41% in 2005.⁶ AV fistula have long term patency rate and provide safe vascular access. According to a study about 20%-60% fistula fail to mature for

successful hemodialysis.⁷ Many times condition of veins is not suitable among the patients with chronic renal failure, hence edema of arm, infection, arteriosclerosis, vascular calcification, multiple veins puncture and vascular calcification are common problems.⁸ Due to these issues other sites can be used for making arteriovenous fistula such as radial or brachial artery fistula with cephalic or basalic vein on non-dominant arm. Brachial artery fistula are associated with high cardiovascular complications and there is limited space for venipuncture for dialysis at this site. An easily palpable fistula not much deep to the skin is easily cannulated than deeper fistula.⁹ By physical examination fistula can be assessed either it is useable or not. Maturation of arteriovenous fistula can be assessed correctly by a skillful physical examination in 72%-80% cases.¹⁰ Fistula complications are associated with high morbidity and mortality rate and economic

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burden as well.

MATERIAL & METHODS

This is a cross sectional study conducted on January 2020 and completed after twelve months period on December 2020. Study was conducted at the Department of Urology and Kidney Transplantation Pir Abdul Qadir Institute of Medical Sciences Gambat. Sample size was calculated using WHO sample size formula. Non-probability consecutive sampling technique was used for the sample selection. Informed consent was taken from all the study cases for including them into the study. Approval was also taken from The Ethical Review Committee for conducting this study (Letter Ref. no. 628 IRB).

Patients with chronic renal failure requiring maintenance hemodialysis were selected for making CBRC arteriovenous fistula at the wrist. Fistula was made at non-dominant limb after examining normal radial pulses. Patients planned for other vascular access or secondary fistula formation were not included in the study. Before doing surgery detailed history was taken and clinical examination was done to see vessels condition, pin pointing of main arterial supply of the hand by Ellens test, and quality of vein and artery were also assessed. Hand dominancy, paralysis, edema, infection, any previous operation at the same forearm, previous venous puncture and skin conditions of the limb were also observed. Procedure of fistula formation was done under local anesthesia. A transverse incision was given at antecubital fossa and cephalic vein, basalic vein and brachial artery were exposed. Vertical incision was made at forearm to expose radial artery and cephalic vein. Arteriovenous anastomosis was made in end to end or side to side fashion depending on the length and mobility of the target vein. While making radio-cephalic anastomosis distal vein was ligated. Fistula was made using non-absorbable proline suture 6-0. Heparin administration was not done routinely in pre and post-operative period. After securing hemostasis skin was sutured using proline 3-0 and circular dressing was applied. Post-operative hand exercises were advised to the patients. All operations were performed by well qualified

consultants. Proposed time of fistula maturation was one month. Follow-up of patients was done for one year to check fistula patency, function and related complications. Fistula failure was labelled when fistula was not matured enough for dialysis or intervention was needed to maintain patency of fistula before doing dialysis.

RESULTS

Study was conducted on 220 cases. There were 126(57.3%) male and 94(42.7%) female cases. Most of the fistula were made on left forearm in 205(93.2%) cases being non dominant side. Commonly made fistula were radio-cephalic in 136(61.8%) cases. During first month after surgery fistula failure was reported in 28(12.7%) cases. Fistula patency rate was 79.1% at three months, 69% at six months and 61.3% at 12 months (Table-I).

Descriptive Statistics	Frequency	Per centage	P-Value
Gender			
Male	126	57.3%	0.032
Female	94	42.7%	
Side of AV Fistula			
Left	205	93.2%	0.001
Right	15	6.8%	
Site of Av Fistula			
Radio-cephalic	136	61.8%	0.012
Radial artery with vena comitans	04	1.8%	
Radial artery with median antebrachial vein	15	6.8%	
Ante-cubital	63	28.6%	
Fistula Patency Rate			
Fistula patency rate at 03 months	174	79.1%	0.011
Fistula patency rate at 06 months	152	69%	
Fistula patency rate at 12 months	135	61.3%	
Table-I. Characteristics of patients in study group. (n=220)			

Most common fistula related complication was infection with burst of fistula reported in

12(5.4%) cases followed by fever in 10(4.5%), pseudo aneurysm in 08(3.6%), perioperative bleeding in 02(0.9%) and fistula burst alone was reported in 05(2.3%) cases (Figure-1). Most common causes of chronic renal failure reported in study patients include diabetes mellitus in 91(41.4%), hypertension in 56(25.4%), diabetes mellitus and hypertension in 44 (20%), chronic glomerulonephritis in 11(05%) and obstructive nephropathy in 08(3.6%) cases (Figure-1). Other less common causes were renal atrophy in 02(0.9%), rapidly progressive glomerulonephritis in 04(1.8%) and chronic interstitial nephritis in 04 (1.8%) cases. Poor outcomes were seen in female patients as out of 85(38.6%) failed fistula at twelve months, 52(23.6%) were female and 33(15%) were male patients. High fistula failure rate was observed among diabetic patients (28.1%).

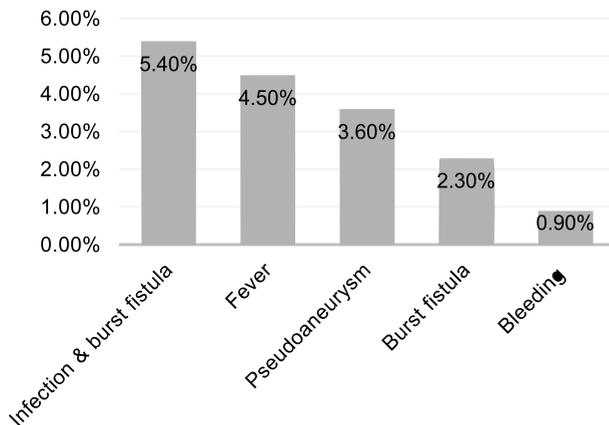


Figure-1. Complications of AV fistula.

DISCUSSION

Arteriovenous fistula is a different type of procedure for urologists as it involves vascular surgery and also embarrassing for patients and it is painful and difficult to take care of fistula for rest of the life.¹¹ Preoperative proper evaluation of the patient is necessary to avoid any complication during the operation or postoperatively. Radiological mapping can be done in difficult cases.¹² Radio-cephalic fistula is easy to make due to adequate length of the artery and vein.¹³ Inston et al described success rate of 96.7% in formation of radio-cephalic fistula. According to him RC fistula is easy to create but long term patency rate was not satisfactory as 53.4% at six months and 44% at 12 months.¹⁴

In our study various types of arteriovenous fistula were made in forearm including radio-cephalic (61.8%), radial artery with median antebrachial vein (6.8%), radial artery with vena comitans (1.8%) and brachial artery with venacomitant (0.9%). Mean patency rate of fistula was 69% at six months and 61.3% at 12 months. Radio-cephalic arteriovenous fistula is a first choice for hemodialysis access as it is easy to make but it has low patency rate among diabetic patients. According to Okamuro et al concluded 62% primary patency rate of RC fistula and stated that there is no difference in patency rate of RC fistula among male and female gender.¹⁵

In our study poor outcomes were seen in female patients as out of 85(38.6%) failed fistula at twelve months, 52(23.6%) were female and 33(15%) were male patients. High fistula failure rate was observed among diabetic patients (28.1%). Yamazaki et al stated 71.2% patency rate of AV fistula at one year and 43% at five years. He stated that high blood level of LDL (>90mg/dl) and diabetes mellitus are associated with high rate of fistula failure.¹⁶ In our study poor outcomes of AV fistula were seen among diabetic patients as 28.1% patients with failed fistulas were diabetics. A study conducted in USA determined outcomes of proximal radial artery AV fistulas created by endovascular technique and achieved much satisfactory results with high success rate. According to their study cumulative patency rate of AV fistula was 97.1%, 93.9%, 93.9% and 92.7%, at 06, 12, 18 and 24 months. Physiologically mature fistula was obtained in 98% cases while failure to access.¹⁷ Manne et al reported that age, gender, diabetes mellitus, type of construction side to side or end to end had no effect on fistula patency rate. Hypotension during dialysis is a main factor causing loss of fistula patency.

Moreover hypertension and smoking are associated with high failure rate of fistula ($p < 0.001$). They observed more failure rate (15.2%) in distal created AV fistula.¹⁸ AV fistula is associated with many complications with high morbidity and mortality rate. Common complications include infection, aneurysm, fever, fistula burst, thrombotic events, venous

hypertension and steal syndrome.¹⁹ A study conducted in Iran by Al-jaishi et al reported AV fistula related complications as infection in 3.3% cases and thrombosis in 10% cases while no catheter dysfunction was not seen in any case with AV fistula during six months period.²⁰ It is necessary to counsel the patients with end stage renal disease about outcomes, morbidity and mortality associated with AV fistula.

CONCLUSION

Arteriovenous fistula made by a skilled surgeon has good outcomes with satisfactory one year patency rate. Arteriovenous fistula provides better and ideal vascular access for hemodialysis but it is associated with significant failure rate and complications. About one third fistula fail in one year duration and poor outcomes noticed among women and patients with diabetes mellitus. Radiocephalic fistula on wrist has better outcomes than fistula in cubital fossa. End to side anastomosis has better outcomes than side to side and end to end anastomosis. Infection and burst fistula were common complications associated with AV fistula.

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