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Original Article

"Prospective study of outcome of 480 arteriovenous fistulas in patient with end stage renal disease" – A single center experience

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Abstract

Background: Patients with End Stage Renal Disease Undergo artereovenous fistulas for Haemodialysis with variable outcomes.

Aims: The arteriovenous fistal is the preferred vascular access for haemodialysis in patients with end stage renal disease. This prospective study was aimed to evaluate the outcome, patency predictors & primary failure rate of 480 arteriovenous fistulas.

Materials and Methods: This prospective study was conducted at Kidney Foundation Hospital & Research Institute, Dhaka, Bangladesh from 1st January, 2014 through 31st December, 2014. 480 patients age ranged from 14 to 70 years with End Stage Renal Disease were included in this study. The patients who died or lost during this period were excluded from this study. All patients before surgery, underwent thorough relevant medical history, physical examination that included examination of upper limb arterial pulses, blood pressure, body temperature, oedema, etc. Left upper limb was chosen for 370 patients and right upper limb was chosen for 110 patients.

Results: Majority of the patients (73%) were between the age of 40 to 70 years and male patients were predominant (56.25%) out of total 480 patients. Twenty four (5%) patients had primary failure, Fifty eight (12.08%) patients had secondary failure. So, total failure rate was 17.08%. Remaining 398 (82.92%) arteriovenous fistula were suitable for haemodialysis during this study period. The causes of AVF failure were thrombosis, aneurysm, stenosis, infection & haemorrhage.

Conclusion: Haemodialysis remains the commonest mode of renal replacement therapy for end stage renal disease patients. Arteriovenous fistula is the reliable mode of vascular access for haemodialysis in end stage renal disease patients. A good functioning AVF provides effective haemodialysis with fewer risk & complications. Effort should therefore be made to give knowledge for the doctors, dialysis staff and patients to achieve a more successful outcome.

Introduction

Haemodialysis remains the commonest mode of renal replacement therapy for End Stage Renal Disease (ESRD) patients. Nearly 80% of ESRD patients in Singapore were on haemodialysis.[1] The Kidney Disease Outcome Quality Initiative (KDOQI) guidelines recommended autogenous arteriovenous radio – cephalic or a brachio - cephalic fistula as the first line options for vascular access.[2]

After Scribner's shunt in 1960, Brescia et al. described the creation of subcutaneous AVF constructed between the radial artery and an adjacent vein in 1966. Cimino fistulas are currently accepted as the best mode of vascular access for haemodialysis.[3] Three types of vascular accesses can be used for haemodialysis such as arteriovenous fistula prosthetic arterio-venous graft and Tunnel Cuffed Catheter[4] but Tunnel Cuffed Catheter being the bridge to obtain either AVF or AVG. Prosthetic arterio-venous graft has higher incidence of infection, shorter patancy, less patient comfortability.

Several studies have demonstrated that autogenous arteriovenous access for chronic haemodialysis has longer patancy compared with prosthetic arteriovenous graft.[5,6] Although, we have increased use of arterio-venous fistula for haemodialysis, a number of complications like primary failure, thrombosis, infection,

aneurysm, stenosis, steal syndrome are noted that have demanded the special peri-operative care and considerations.

Materials and Methods

This prospective study was conducted at Kidney Foundation Hospital & Research Institute, Dhaka, Bangladesh, from 1st January, 2014 to 31st December, 2014. Patients of age 14 to 70 years with end stage renal disease were included in this study. 480 patients, who fulfilled the inclusion criteria were selected. All of the patients were referred by nephrologists. All patients before operation, underwent relevant history & detailed physical examination such as examination of peripheral arterial pulses, blood pressure, body temperature & oedema. Left upper limb was chosen for 370 patients and right upper limb was chosen for 110 patients Radio-Cephalic (end to side) arteriovenous fistula was constructed in 185 cases, brachio-cephalic arteriovenous fistula was constructed in 245 cases and brachio-basilic arteriovenous fistula was created in 50 cases.

Operative procedure in details

Selected upper limb was thoroughly cleaned with soap and water and then washed with povidone iodine solution. This procedure was performed under local anaesthetics 2% lignocaine that was injected at the site of operation. After proper cleansing, sterilizing, drapping and anaesthesia, a longitudinal incision (5-6 cm) was made at the lower third of forearm between radial artery and cephalic vein. Then cephalic vein was gently dissected and mobilized as required, then dissection of radial artery with very much caution to avoid any spasm and finally connect with cephalic vein (end to side) by 7 '0' prolene without any tension or any acute angle. Similar technique was also followed during brachio-cephalic or brachio-basilic anastomosis but transverse incision was made in cubital fossa and 6 '0' prolene was used for vascular anastomosis. Adequate haemostasis was done. Wound was closed in single layer by 3 '0' non-absorbable silk.

We did follow-up of these 480 patients by the collaboration with operation room staff, dialysis unit staff & nephrologists. Most of the patients were discharged on the same day. Relevant instructions about care of arteriovenous fistula were given to the patients and their relatives. Handball exercises were taught to patients after operation. First routine follow up was done on 3rd postoperative day then once a week for 4 weeks then twice a month for 2 months. All patients were looked for any complications or any concern.

Results

From 1st January, 2014 through 31st December, 2014, 480 patients with end stage renal disease underwent procedure for AVF creation and age of the patient ranged from 14 to 70 years with mean age of 49.33 years. Majority of the patients (73%) were between 40-70 years of age. Out of these 480 patients, 270 (56.25%) were male and 210 (43.75%) were female.

This study found that 480 end stage renal disease (GFR ≤15 ml/min) or CKD stage-V was caused by diabetes mellitus (37%), chronic glomerulonephritis (35%) and Hypertensive Renal Disease (20%).

During this study period it was found that 24 patients (5%) had primary fistula failure, 58 (12.08%) had secondary fistula failure that was due to thrombosis in 34 (7.08%), aneurysm in 15 patients (3.12%), Stenosis 5 (1.04%) and other causes in 4 patients (.83%). Remaining 398 patients (82.9%) had good functioning AFVs for effective haemodialysis during this period.

Table-1: Distribution of the patient according to Age.

Age	Frequency	Percentage	Mean
14 – 20	9	2	49.33
21 – 30	38	7.9	
31 – 40	81	16.87	
41 – 50	96	20	
51 – 60	120	25	
61 – 70	136	28.33	

Table-2: Distribution of the patient according to Gender.

Gender	No.	Percentage
Male	270	56.25%
Female	210	43.75%

Table-3: Distribution of the patient according to the site of AVFs creation.

Upper limb	No.	Percentage
Right upper limb	110	20.29%
Left upper limb Non-dominant	370	79.71%

Table-4: Distribution of the patient according to type of anastomosis.

Vessel	No.	Percentage
Radio – cephalic	185	38.54%
Brachio – cephalic	245	51.04%
Brachio – basilica	50	10.42%

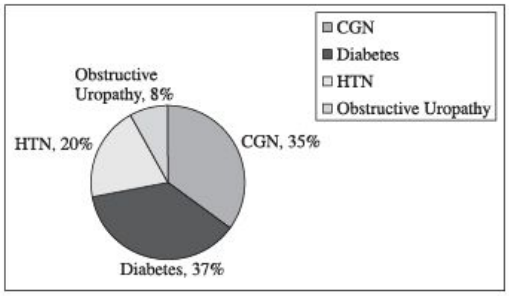

Figure-1: Distribution of the patients according to cause of End Stage Renal Disease.

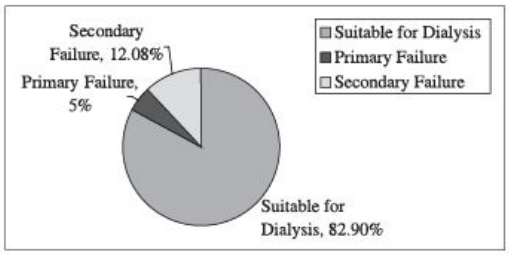

Figure-2: Distribution of the patients according to outcome of arterio-venous fistulas.

Discussion

Kidney disease is a common problem in this country. When both kidneys looses its total or partial function permanently then it considered as chronic kidney disease or CKD. CKD has five different stages on the basis of glomerular filtration rate (GFR). When GFR of an individual equal or less than 15ml/mint then it is called CKD-V or End Stage Renal Disease (ESRD). About 30-35 thousand patients die every year due to end stage renal disease. Many of these patients are not aware of their kidney disease even 6 months before death.

One study showed that there was 17 to 18 million of adult population suffered from chronic kidney disease (CKD) stage 1 to stage 5.[5,7,8,9] Dialysis or renal transplant is the mode renal replacement therapy in end stage renal diseased patient to sustain their lives. Hemodialysis is the commonest mode of therapy for many ESRD patients. A good functioning vascular access is essential for haemodialysis. There are three types of vascular accesses that are arteriovenous fistula (AVF), prosthetic arteriovenous graft (AVG) and Tunnel Cuffed Catheter (TCC). But TCC acts as a bridge to obtain either AVF or AVG. Functional survival of AVG is much shorter than AVF. AVG has a higher incidence of thrombosis and infection than AVF. AVG infections are serious complications and are the second leading cause of dialysis access loss.[10] So, AVF is the preferred type of vascular access for haemodialysis as because it has less chance of infection, higher patency, less financial burden and excellent patient comfortability. Although arteriovenous fistulas have some undesirable complications. From this study, it was found that 40 to 70 years age group patients (73.3%) suffered from ESRD and male patients were more (56.25%). The commonest causes of ESRD were diabetes (37%), CGN (35%), HTN (20%) and others including obstructive uropathy (8%). Left upper limb is the first choice for construction of AVF but if there is any unsuitability of the left hand vessels then second upper limb is to be considered for construction for AVF.

When AVF failed within two weeks of creation & never used for haemodialysis then it is considered as primary failure. In this study it was found that only 24 patients (5%) developed primary failure out of 480 patietns. Causes of primary failure might be poor quality of vessels, technical issue, haemorrhage and infection. All patients underwent haemodialysis through arterio-venous fistula at least 6 weeks or later from the date of construction. These group of patients who lost their AVF after using for haemodialysis then it is considered as secondary failure. 58 (12.08%) patients lost their AVFs after using a certain time during this study period. This secondary failure was caused by thrombosis in 34 patients (7.08%), aneurysm in 15 patients (3.12%), stenosis in 5 patients (1%) and other reason in 4 patients (.8%).

Pre-operative patient assessment that should be included physical examination, nutritional status & Doppler ultrasound of upper limb in some cases, early construction of AVF, late puncture (not less than 6 weeks), minimum trauma to the anastomotic vessels and maticuloss anastomosis without any acute angle or tension could be important considerable factors to obtain best outcome of arteriovenous fistula.

Conclusion

A good functioning AVF is an essential requirement for effective haemodialysis in patient with ESRD. The complicated AVFs may be the causative factor for hospitalization in chronic haemodialysis patient that may lead to huge financial burden to the patient as well as physical morbidity and ultimately be fatal. So, adequate AVF care should be a priority not only for the patient but also for whole professional team including dialysis staff.

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