

Arterio-Venous (AV) Fistula: Surgical outcome in College of Medical Sciences Teaching Hospital, Bharatpur, Chitwan

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Abstract

Aims

Arteriovenous fistula is considered as reliable form of vascular access for hemodialysis in Chronic Kidney Disease (CKD) patients. We aim to evaluate prospectively, the outcome and primary failure rate of Arteriovenous fistula in 30 Chronic kidney Disease patients with Glomerular Filtration Rate (GFR) <30ml/min.

Materials and methods

This prospective study was conducted at the department of cardiothoracic and vascular surgery (CTVS), College of Medical Sciences, Bharatpur from May 2011 to May 2012. Thirty patients ranging from age 25 to 76 years with stage IV and V CKD, i.e. GFR below 30ml/min, were included in this study. Detailed physical examination including arterial pulses i.e. axillary, brachial, radial and ulnar and blood pressure in both upper limbs was recorded. Allens test was performed on every patient and left upper limb was used for AV fistula formation. Brachiocephalic fistula was made in 19 (63.33%), while radiocephalic fistula was made in 11 (36.67%) patients. Patients were evaluated post operatively, on outdoor basis, weekly for 6weeks. All patients were evaluated for the presence or absence of complications i.e. infection, hematoma, thrombosis, aneurysms and steal syndrome.

Results

The complication was primary failure in two patients. One male patient got secondary infection and one female patient got post operative hematoma leading to 6.66% primary failure of fistula. No other complications were noted.

Conclusion

Arteriovenous fistula is the gold standard for vascular access for hemodialysis in patients with deteriorating renal function and end-stage renal disease. It is designed to improve the effectiveness of dialysis with fewer risks and complications than other vascular accesses. This study gives the higher success rate of 93.33% and concludes that age should not be a limiting factor when determining candidacy for arteriovenous fistula creation and is the safe procedure.

Key words: Arteriovenous fistula, chronic kidney disease (CKD), surgical outcome.

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Introduction

The arteriovenous fistula was first described and used as a reliable form of hemodialysis vascular access by Brescia and Cimino in 1966.¹ Patients with deteriorating renal function and end-stage renal disease require vascular access that is safe, reliable, and associated with minimal complications.² A well functioning and reliable vascular access is an absolute requirement to provide life-sustaining treatments for patients on hemodialysis. The three types of vascular access used by most dialysis patients are fistulas, grafts, and tunneled catheters.³ Autogenous arteriovenous access for hemodialysis has been shown to be superior to prosthetic graft or catheter access in terms of patient morbidity and mortality. In addition, the maintenance of autogenous AV access is less expensive than prosthetic conduits.⁴ Several studies have demonstrated that autogenous arteriovenous access for chronic hemodialysis has longer patency compared with prosthetic access.^{5,6} The National Kidney Foundation Dialysis Outcomes Quality Initiative (NKF KDOQI) advocated the use of autogenous access if possible in all clinical scenarios.⁷

Present study was conducted to evaluate the outcome and primary failure rate of arteriovenous fistula, at the department of cardiothoracic and vascular surgery, college of medical sciences teaching hospital, Bharatpur, Chitwan.

Materials and methods

This prospective study was conducted at the Department of CTVS, College of Medical Sciences, Bharatpur from May 2011 to May 2012. Patients of age 25 to 76 years with stage IV and V CKD, i.e. GFR below 30ml/min, were included in this study. Total

number of 30 patients who fulfilled the inclusion criteria were selected.

Detailed physical examination of every patient was done. Arterial pulses i.e. axillary, brachial, radial and ulnar and blood pressure in both upper limbs was recorded. Allens test was performed on every patient and left upper limb was used for AV fistula formation.

Procedural detail:

Procedure was performed using a local anesthesia i.e. 2% lignocaine injected at the site of the proposed fistula. After cleansing and sterilizing the site, a transverse curvilinear incision was given. Cephalic vein was gently mobilized to the length needed to comfortably reach the arterial anastomotic site. The upper aspect of the vein was marked during dissection while the vein was in its normal position, in order to prevent rotation. Inflation of the tourniquet cuff to 60 mm Hg facilitated identification and dissection of the vein when necessary. Only the anterior surface of the artery was exposed. No arterial branches were ligated. A 10-mm arteriotomy was performed in the forearm while 5 mm in the arm with surgical blade number 11 and Pott's scissors. The vein was sharply cut, venous patency checked by injecting heparinised saline. Venous dilatation done with heparinised saline with 5cc syringe and size of vein measured for anastomosis. An end-to-side anastomosis was performed with Prolene 6/0 suture. In the forearm anastomosis was made between radial artery and cephalic vein while brachial artery and cephalic vein in the arm. Haemostasis was assessed and the wound was closed in two layers using 3/0 absorbable sutures for the subcutaneous layer and subcuticular stitch. Gentle Antiseptic dressing was done.

Post-operative follow ups:

Every patient was discharged on the 1st day after surgery on oral antibiotics and analgesic for seven days with instructions to begin hand exercises with a solid foam-rubber ball the size of a tennis ball(Fistula Ball) on the 1st postoperative day. The follow up was performed on outpatient basis, every 7th day for 6 weeks after which fistula was released to puncture for hemodialysis. The primary failure rate was assessed in the initial 2 weeks post-operatively by feeling strong thrill at arterial anastomosis and auscultation for continuous low-pitched bruit. All patients were evaluated for the presence or absence of complications i.e. infection, hematoma, thrombosis, aneurysms and steal syndrome, on follow up visits.

Result

The total number of patients included in this study was 30 and their age ranged from 25 to 79 years with mean age of 55 ± 20 years (Table 1). Majority of the patients (50.0%) were between 41 to 60 years of age. Out of these 30 patients, 19 (63.33%) were male and 11 (36.67%) were females with ratio 1.7:1. Majority of patients presented with CKD type IV and type V. Brachiocephalic fistula was made in 19 (63.33%), while radiocephalic fistula was made in 11 (36.67%) patients (Table 2).

The complication was primary failure in two patients. One male patient got secondary infection and one female patient got post operative hematoma leading to 6.66% primary failure of fistula. No other complications were noted.

Table 1. Age distribution according to gender

Age (Years)	Male		Female		Total	
	No. of Patients	% age	No. of Patient	% age	No. of Patient	% age
21-40	4	13.33	1	3.33	5	16.67
41-60	9	30	6	20	15	50
Above 61	6	20	4	13.33	10	33.33
Total	19	63.33	11	36.67	30	100

Table 2. Percentage of patients according to site of AV fistula and gender

Site	Male		Female		Total	
	No. of Patients	% age	No. of Patient	% age	No. of Patient	% age
BC	12	40	7	23.33	19	63.33
RC	7	23.33	4	13.33	11	36.67
Total	19	63.33	11	36.67	30	100

Discussion

Most patients with end-stage renal failure still spend an appreciable amount of time on haemodialysis (HD), either as a definitive treatment or waiting for transplants.⁸ HD is based on diffusion—the exchange of solutes through a semipermeable membrane along a concentration gradient from one fluid (usually the plasma) to another (usually the dialysate).⁹ There is no consensus on the optimal timing of fistula surgery. The DOQUI guidelines recommend to establish vascular access when the serum creatinine concentration exceeds 4 mg/dl and the estimated GFR is < 25 ml/min.⁷ In our study, we have selected patients with GFR < 30 ml/min (Grade IV & V CKD). Fistulas are usually created in the nondominant arm and may be situated on the forearm (usually a radiocephalic fistula, or so-called Brescia-Cimino fistula, in which the radial artery is anastomosed to the cephalic vein), or the elbow (usually a brachiocephalic fistula, where the brachial artery is anastomosed to the cephalic vein).¹⁰ Maturation times of 1–4 months must elapse following creation of an autologous fistula before it can be used. The fistula should, therefore, preferably be created several months in advance of the anticipated need for dialysis or an alternative temporary method of vascular access must be used while the fistula develops.¹¹

There are three different types of vascular access: arteriovenous fistula, graft and catheter but the groundbreaking article by Brescia and Cimino in 1966 revolutionized the creation of the vascular access and then after the Cimino fistula was used in almost all dialysis patients.^{4,10} An arteriovenous fistula is preferred and has proven to be the most successful type of vascular access because it lasts longer, has low rate of complications and easy handling.¹²⁻¹⁴

In this study, we have used left upper limb and side to side anastomosis technique for arteriovenous fistula creation in all patients and made 63.33% brachiocephalic and 36.67% radiocephalic fistulas. The presentation age in our study varied from 25 to 76 years with the mean age of 55 ± 20 years. Majority of the patients (50.0%) were between 41 to 60 years of age.

The result in our study confirm that patient age is not a factor in the success of procedure and arteriovenous fistula should not be withheld from patients on the basis of age as observed by Lok et al.¹ In our study, 19 (63.33%) were male and 11 (36.67%) were females with ratio 1.7:1. Out of these 30 patients, two complication of primary failure was noted. One male patient got secondary infection and one female patient got post operative hematoma leading to 6.66% primary failure of fistula. Numerous studies have reported a lower prevalence of fistula use in women than in men but the reasons for this discrepancy have not been adequately elucidated.^{15,16}

Haimov M et al¹⁷ and Suwitchakul C et al¹⁸ reported wound infection in 4.4% and 2.0% and observed steal syndrome in 1.6% and 2.0% respectively while in our study, it was not found in any patient. Incidence of primary failure rate (within 2 weeks) in our study was 3.33% while Rooijens PPGM et al.¹⁹ reported its incidence 15.3% and Shemesh D et al.²⁰ 6.8%. Early failure was reported to be 40%-55% in the American series and about 7% to 10% in the European series.¹⁵ So, primary failure rate was much lower in our study as compared to other ones. Thrombosis observed in different studies range from 2.0-7.0%^{17,18} while in our study it was found in none. There was a hematoma

formation(3.33%) in our study while Suwitchakul C et al¹⁸ reported its incidence 3.0%. False aneurysm was not seen in any patient in our study while in other study it was observed in 2.0% cases.²⁰ So, in our study, overall success rate was 93.33% which is far higher in comparison to many previous studies.^{3,13,17-21}

Conclusion

Arteriovenous fistula is the gold standard for vascular access for hemodialysis in patients with deteriorating renal function and end-stage renal disease. It is designed to improve the effectiveness of dialysis with fewer risks and complications than other vascular accesses. This study gives the higher success rate of 93.33% and concludes that age should not be a limiting factor when determining candidacy for arteriovenous fistula creation and is the safe procedure.

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