

SUPERFICIALIZATION OF THE BASILIC VEIN IN BRACHIOBASILIC ARTERIOVENOUS FISTULA: AN ALTERNATIVE VASCULAR ACCESS FOR HEMODIALYSIS- A SINGLE CENTER EXPERIENCE

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ABSTRACT

Introduction: The use of basilic vein to create brachiobasilic arteriovenous fistula (BBAVF) is the vascular access option of choice for hemodialysis when cephalic veins are not available. To create BBAVF, the basilic vein should be superficialized and lateralized. The study aims to highlight the outcome and morbidity of BBAVF at the tertiary referral center and aims to improve the results of the procedure in patients with chronic renal failure.

Materials and Methods: This is prospective, descriptive study conducted at College of Medical Sciences Teaching Hospital from January 2019 to December 2022. The demographic data, morbidities, results were analyzed using the Statistical Package for Social Sciences (SPSS) version 23.0 (SPSS).

Results: We evaluated outcome of total forty patients who underwent BBAVF with transposition of basilic vein. The mean age of patients was 61 ± 10.85 years and male:female ratio Was 2.07:1. The mean size of basilic vein was 3.05 ± 0.84 mm and brachial artery was 4.11 ± 0.99 mm. The most common co-morbidities in this study was Diabetes Mellitus and hypertension both was present in 52.5% of patients, only hypertension in 27.5%, only Diabetes Mellitus in 5%, HTN with PVD in 2.5% and HTN, Diabetes Mellitus with PVD in 2.5% of patients. The postoperative complications were bleeding in 25% (10), infection 10% (4), primary failure 7.5% (3), pseudoaneurysm 5% (2), and oedema 7.5% (3). Total 82.5% (33) of cases were able to start dialysis in 45 days. The failure rate was 12.5% (5) due to thrombosis and pseudoaneurysm.

Conclusion: BBAVF is a suitable option for vascular access in patients with failed previous AVF or patients with small cephalic vein. Relocation of basilic vein for AVF is feasible, safe and with good patency and complication rates are acceptable.

Keywords: Arteriovenous Fistula, Brachiobasilic Fistula, Hemodialysis Access

INTRODUCTION

Vascular access (VA) is the most important in patients with end-stage renal disease undergoing long-term hemodialysis. Radiocephalic and brachiocephalic arteriovenous fistulas still remain the first and a second choice for creating a native VA for hemodialysis.¹ If these options are not possible due to anatomical reasons, basilic vein transposition can be considered because basilic vein is used very rarely for intravenous lines and venipuncture due to its anatomical location. When all the other alternatives of VA placement on the upper extremities have been exhausted, basilic vein transposition and the creation of brachial-basilicarteriovenous fistula (BBAVF) offers a suitable alternative over central vein cannulation, decreasing the overall cost of

dialysis patients and morbidity as per the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines.²

The basilic vein in the arm is located deep and medial that requires superficialization and lateralization to anterolaterally to permit cannulation for hemodialysis (HD). It is a relatively hidden vein, which often escapes the trauma of repeated venipuncture and intravenous cannulation making it a high quality conduit for HD.³ The patency rates of BBAVF vary from 65% to 70% at 1 year and 49% to 51% at 2 years⁴ which are favorable to the alternative prosthetic polytetrafluoroethylene (PTFE) grafts.⁵ In this study, we aimed to evaluate the outcome of relocation and transposition of the basilic vein in

brachiobasilic fistulas in chronic renal failure patients.

MATERIALS AND METHODS

In a single center study, from January 2019 to December 2022, all patients in whom previous forearm AVF was failed or creation of a forearm AVF was not suitable were evaluated for the study. This is a prospective, descriptive study based on pre-operative assessment and follow up. The data collected was recorded and analyzed. The outcomes and complications encountered during the procedure and afterwards was recorded and presented in this paper.

Ethical approval: The study was approved by the ethical committee of College of Medical Sciences, Chitwan, Nepal.

All patients who were referred to a brachiobasilic AV fistula underwent pre-assessment and underwent duplex scans to assess suitability for the fistula. Demographic details (age, sex, dialysis status and co-morbidities) and operative details (site of AVF, anaesthetic technique) were collected for all patients. At the physical evaluation, arterial pulse strength, presence of a recent access, formation of a prominent elastic structure upon application of pressure, and vein diameters were assessed to determine the surgical site. The size of vein (at least 3mm) and artery (at least 2mm) were criteria for the procedure.

Surgical procedure:

All patients underwent one-stage procedure. The one-stage procedure was always performed under arm block. The basilic vein was mobilized fully from elbow to the axilla using a single incision in the inner aspect of the arm, rather than multiple relieving incisions. The vein was then tunneled using a standard vascular tunneller within the subcutaneous tissue of the anterior upper arm. The basilic vein was then anastomosed to the brachial artery in the antecubital fossa using 6.0 prolene sutures. Once done, clamps were removed and bleeding was controlled. Finally the wound was closed in layers using 3.0 polyglactin and skin closure by 3/0 prolene. A day after surgery, the patients were evaluated for possible thrill on the basilic vein, if there was no complications, patients were discharged. Patients were also evaluated for possible complications 7 and 14 days post-operatively. Patients were assessed in the post-operative period for complications consisted of wound site infections, bleeding, hematoma, neuropathy, pseudoaneurysm formation and venous hypertension. All fistula were scanned by duplex ultrasound after 45 days of AVF creation. The primary outcome of the study was successful cannulation of AVF. Secondary outcomes were flow rate and vein diameters obtained by duplex scanning of AVF defined by vein diameter greater than 6

mm and flow rate of more than 600 mL/min.⁶

During BBAVF creation, Intravenous unfractionated heparin 5000 IU just before procedure and antibiotic therapy with cefazolin (1 g) was given intravenously 1 hour before the procedure and then in 12-hour intervals. In total, each patient was intravenously administered 3 g of cefazolin.

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 23.0 (SPSS).



Figure 1: Exposure of basilic vein on the left arm.



Figure 2: Left arm after closure of incision site.

RESULTS

A total of forty patients were included in this study. Twenty-seven were male and thirteen were female with M:F=2.07:1 as shown in figure 3 below. The mean age of patient was 61 ± 10.85 years. The patients comorbidities is shown in table 1 below.

The mean diameter of basilic vein and brachial artery undergoing BBAVF is measured using 2D Doppler ultrasound. The size of brachial vein is 3.05 ± 0.84 mm and mean diameter of brachial artery is 4.11 ± 0.99 mm.

Among 40 patients, all BBAVF were patent at the time of discharge from hospital. Three of the patients had early failure due to thrombosis and had to make another fistula. Another two patients had pseudoaneurysm presented in 2 weeks, with one had ruptured pseudoaneurysm, both managed with interposition venous graft. Bleeding

was seen in 10 patients and none of them required re-exploration. Local wound infection was present in 4 patients requiring daily dressing and antibiotics coverage for 5 to 7 days. In our study, 2 patients out of 40 were unable to contact following the procedure.

Table 1: Co-morbidities in study patients

Co-morbidities	Freq	Percent (%)
Hypertension and Diabetes Mellitus	21	52.5%
Hypertension (HTN)	11	27.5%
Diabetes Mellitus(DM)	2	5.0%
HTN and PVD	1	2.5%
HTN, DM and PVD	1	2.5%

PVD= Peripheral Vascular Disease

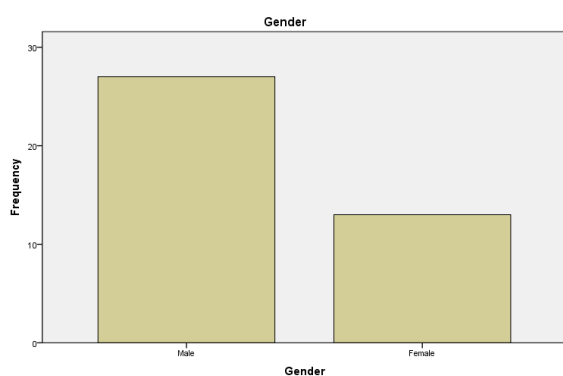


Figure 3: Gender of patients in the study

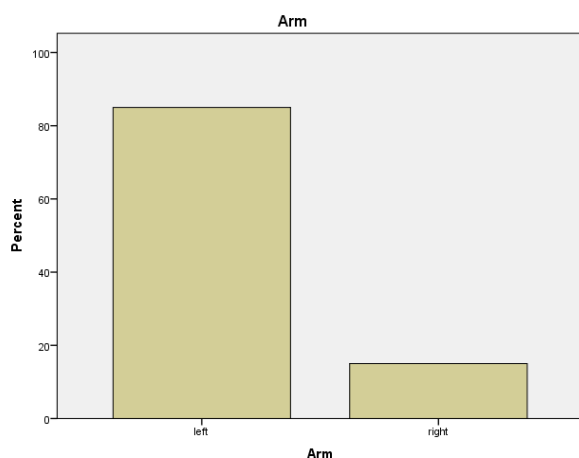


Figure 4: BBAVF made in the arm

In total 85% (34) BBAVF were created in left arm and 15% (6) were created in right arm

Table 2: Postoperative complications in study patients

Outcomes	Number of Patients	Percentage
Bleeding	10	25%
Infections	4	10%
Primary failure	3	7.5%
Pseudoaneurysm	2	5%
Matured (45 days)	33	82.5%
Oedema	3	7.5%
Steal syndrome	None	
Neuropathy	None	

DISCUSSION

According to the Vascular access guidelines, radial-cephalic (RC) and brachial-cephalic (BC) fistula are the first and second choices for hemodialysis respectively, and in the absence of adequate veins or after failed RC/BC access, a brachial-basilic fistula or arteriovenous graft should be considered.⁷ Elevation and tunneled transposition of basilic vein is the most commonly used method of superficialization that allows easier cannulation during dialysis. This procedure is associated with increased wound infection and fistula occlusion due to the length of the surgical incision and manipulation of the conduit. Brachio-basilic AVF is a reliable form of vascular access and should be considered before insertion of prosthetic conduit in patients with unsuitable cephalic vein at the wrist or elbow.⁸ It has many advantages over prosthetic graft. Basilic vein transposition (BVT) was first described in 1976 and has been increasingly accepted as a viable option for secondary or tertiary vascular access.⁹ In a single-stage procedure, basilic vein can easily twist during tunneling and cause immediate thrombosis or stenosis in the vein near the axillary and basilic junction (swing point).

In this study, the mean age of patients was 61 ± 10.85 years with maximum age of 79 years and minimum of 34 years. The male to female ratio was 2.07:1. The age and gender ratios are comparable to other studies.

The size of vein (at least 3mm) and artery (at least 2mm) is one of the important criteria for better outcome. In this study the size of basilic vein was 3.05 ± 0.84mm and brachial artery was 4.11 ± 0.99 mm. In a research by Shrestha et. al the mean diameter of basilic vein undergoing brachio-basilic AVF (BBAVF) as measured using 2D Doppler ultrasound was 3.46 ± 0.4mm and mean diameter of brachial artery is 3.81 ± 1.6mm.¹⁰ The most common co-morbidities in this study were Diabetes Mellitus and hypertension both, present in 52.5% of patients, only hypertension in 27.5%, only Diabetes Mellitus in 5%, HTN with PVD in 2.5% and HTN, Diabetes with PVD in 2.5% of patients. In a study by Shrestha et.

al it was found to be Diabetes in 83.05%, hypertension 91.53%, PVD 20.34% and smoking 42.37%.

In our study, total 82.5% (33) of cases were able to start dialysis in 45 days. They all were patent in 6 months follow up. The failure rate was 12.5% (5) due to thrombosis and ruptured pseudoaneurysm. In different studies failure rates are 21-36%.¹¹ In another study done in India, the mean fistula maturation time was 42 ± 10 days.¹² Maya et al. have reported primary access failures of 18%.¹³ Silva et al found the lower primary failure rate of 8%.¹⁴ The reported complication rate for brachio basilic arterio venous fistula (BBAVF) remains high at 47%-71%.¹⁵

In a study by kakaie et. al there were post-operative complications in 40.7% of patients including venous hypertension 4.8%, bleeding 7.4%, hematoma 7.4% and distal paresthesia 11.1%.⁶ The post-operative complications, infection rate was 7% in the study conducted by Dagher et al⁷ and 14% in study conducted by Veeramanive et al.⁸

In this study post-operative complications were bleeding in 25% (10), infection 10% (4), primary failure 7.5% (3), pseudoaneurysm 5% (2), oedema 7.5% (3) and none had steal syndrome and neuropathy. The most common complication was bleeding which is due to use of loading dose of IV heparin as well as long and deep incision for exposure of basilic vein. But none of them required re-exploration. The pseudoaneurysm was found to be 3.4% (2) in a study by Rivers et al¹⁶ and 6.7% (4) in a study by Shrestha et al¹⁰, our study found 5% (2).

CONCLUSION

Single stage brachio basilic AVF (BBAVF) created by superficialization and transposition of basilic vein is a suitable option for vascular access in cases where radiocephalic and brachiocephalic AVF creation is not possible. It is safe, feasible and has good patency.

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