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Original Research Article

To determine the outcome of the created Arteriovenous fistula

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Abstract

Background & Methods: The aim of the study is to determine the outcome of the created Arteriovenous fistula. Preoperative evaluation also included Doppler ultrasound (Duplex) to look for patency and size of vessels used (Radial artery and cephalic vein) at distal forearm in all patients. The minimum diameter for radial artery and cephalic vein to be used were 1.4 and 2 mm respectively. Also calcification was noted both on ultrasound and perioperatively. Immediate patency was noted by thrill in postoperative period. All patients were admitted a day prior to surgery and the waiting period was 1-3 days. Patients were discharged within 48 hours of postoperative period after the first USG examination of AV Fistula.

Results: The chi-square statistic is 4.0599. The *p*-value is .043912. The result is significant at $p < .05$.

Conclusion: AV fistula successful rate was observed was 73%. Angioaccess procedures should not be considered as minor procedures. These operations must be restricted to surgeons with demonstrable interest and experience, or they should at least be carried out under their supervision. Preoperative DUS evaluation should become a routine tool for all vascular access surgeons. Vascular surgeons should be involved in vascular access care as much as possible. To conclude, more nephrologists should be participating in AVF creation thus improving patient care as access creation is not a priority for surgeons.

Keywords: outcome, arteriovenous & fistula.

Study Design: Observational Study.

Introduction

An arteriovenous (AV) fistula for dialysis is a deliberate surgically created anastomosis between an artery and a vein. After the surgery, the vein which now receives blood under high pressure from its connection to the artery, begins to dilate and thicken[1]. The AVF is said to be 'mature' when the vein is big enough and visible just under the skin where it can now be cannulated and connected to the dialysis machine. Its function and patency are critical in the delivery of effective hemodialysis[2]. The possible configurations of AVF are radiocephalic, forearm basilic, brachiocephalic, brachiobasilic and lower extremity AVF, which is an anastomosis in the thigh between the popliteal/femoral/saphenous vein and the superficial femoral artery. There are several characteristics th4 must be present for an AVF to be successful

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and be usable. These include, blood flow must be at least 500 to 700 ml/min to support the dialysis prescription, a relatively straight segment of 8 to 10cm long needs to be available for cannulation, it must be able to be reliably cannulated repeatedly, it should be within 5 to 6 mm of the skin surface, it should be on the anterior or lateral surface in the upper arm, it should be on the volar surface in the forearm and the AVF must be accessible with the patient in a comfortable sitting position[3].

AVF is considered the optimal vascular access because of its superior durability, lower risk of infection, and decreased number of interventions to maintain patency[4]. Autologous (native) arteriovenous fistula (AVF) provides the best access to the circulation because of low complication rate, long-term use and lower costs, compared to arteriovenous graft (AVG) and central venous catheter (CVC). The cost of vascular access care was more than five times lower in those who had begun treatment with functioning AVF, compared to those who were treated with a graft or permanent catheter. The main factor limiting fistula use is a high rate (up to 70%) of primary failure. To avoid unsuccesful attenpts, guidelines recommend preoperative duplex ultrasonography (DUS) and the use of vessels with a diameter able to maintain sufficient blood flow and fistula maturation. The impact of vessel diameter was evaluated in numerous studies. In some studies, artery and vein diameters below 2 mm were predictors of high incidence of early thrombosis or failure of maturation, and some authors recommend to set a cut-off size of the artery and the vein.

Two other studies found no difference in fistula outcome for hyperaemic response. Preoperative venous size and, especially, vein distensibility are also difficult to measure. Planken et al[5]. revealed daily variations in forearm venous diameters, which should be taken into account when defining cut-off diameters prior to vascular access surgery. Lockhart et al[6]. recommended using a venous tourniquet in preoperative DUS which increases the number of patients eligible for forearm fistulas without decreasing the adequacy rate.

Material and Methods

Present study was conducted on 100 cases for 01 Year. All cases were admitted on the day of surgery. All surgeries were done by nephrologists under 5-7 ml LA using 2% lignocaine. Magnifying loupe was not used. A 5 cm long skin incision was given. Only distal radial artery and cephalic vein were used and only end vein to side artery anastomosis was performed. Arteriotomy size in all the cases was 6-8 mm. No perioperative diameter was measured. We dilated the distal vein using cannula (20G) and passed 5-0/6- 0 feeding tube till elbow for ruling out any thrombus and for assistance during anastomosis. Anastomosis was done by taking continuous running suture using 6-0 polypropylene/ PTFE. Skin was closed using either mersilk or metallic staples.

The indications for AV Fistula creation were: Individuals already initiated on HD through temporary access and those in whom RRT is required in near future as per NKF- KDOQI guidelines. All the fistulas were created in non-dominant forearm and only distal radiocephalic fistulas were created.

History included age, sex, and duration of Diabetes, Hypertension, coronary artery disease, and chronic kidney disease. Besides general physical examination, specific arterial (Peripheral

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vessels, Allen test, blood pressure) and venous system examination including vein mapping on USG was done.

Fig 1: Radiocephalic fistula Depicting radial artery and cephalic vein

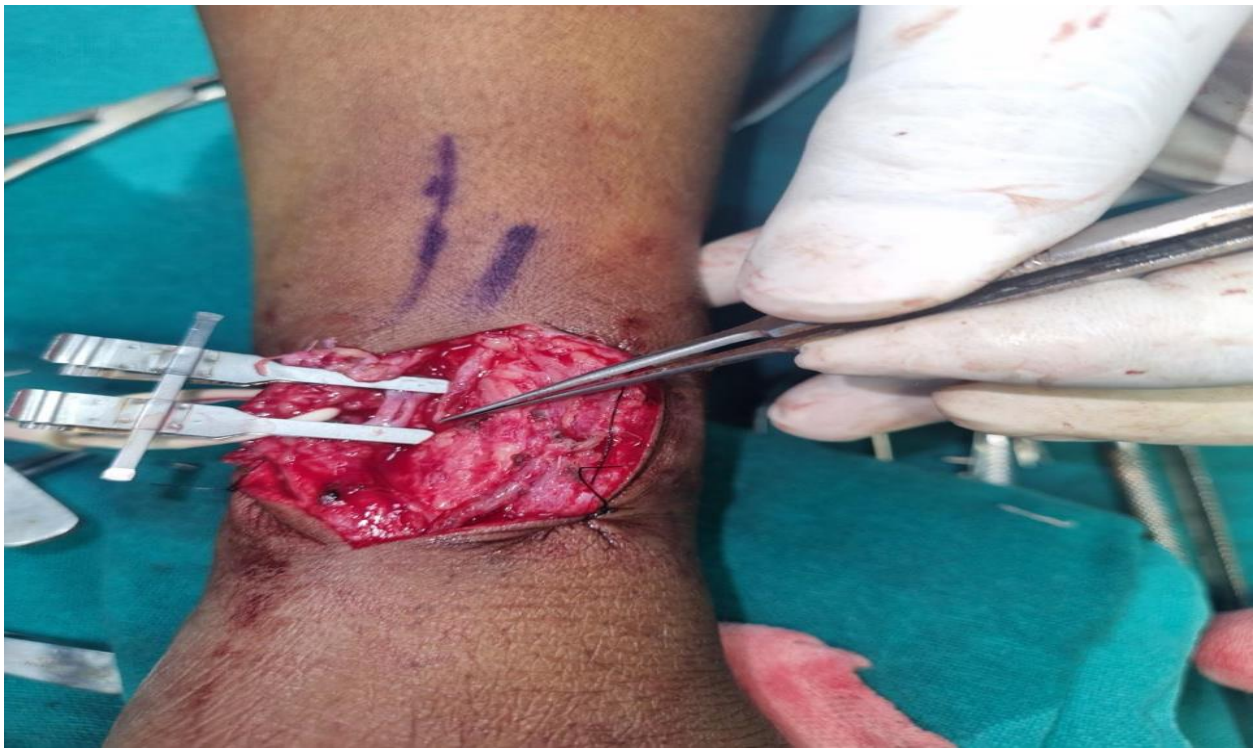

Fig 2: Marking done for brachiocephalic fistula Showing brachial artery and cephalic vein

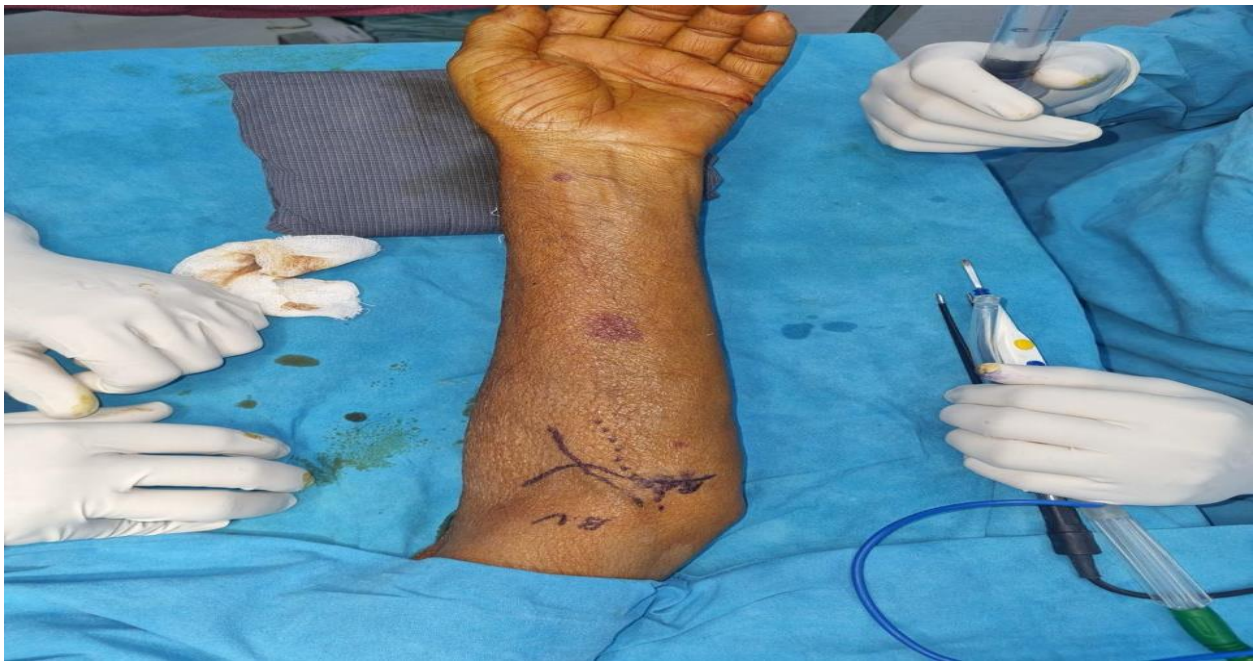

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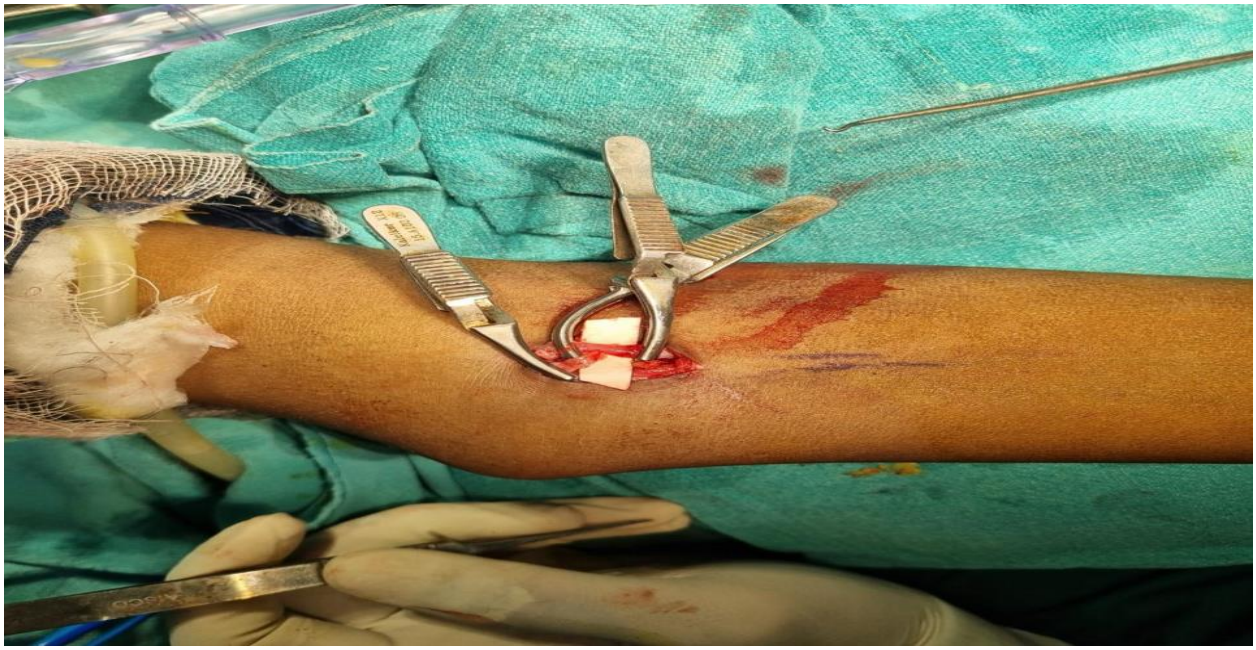
Fig 3: brachiocephalic fistula Showing brachial artery and cephalic vein



Result

Table No. 1: Age & Sex Distribution

S. No.	Age	No	Percentage
1	≤30	14	14
2	31-40	15	15
3	41-50	24	24
4	51-60	21	21
5	61-70	21	21
6	More than 70	05	05
	Sex	No	Percentage
1	Male	63	63
2	Female	37	37

Table No. 2: Clinical Comorbidity

S. No.	Clinical Comorbidity	No.	Percentage	P Value
1	Congestion	01	01	.048396
2	Obesity	01	01	
3	DM	27	27	
4	None	71	71	

The chi-square statistic is 2.49. The *p*-value is .048396. The result is significant at $p < .05$.

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Table No. 3: Mean of Artery Diameter

S. No.	Artery	Mean	SD
1	Brachial Artery	4.1	1.7
2	Radial Artery	2.8	3.6

Table No. 4: Type of AVF created

S. No.	Type of AVF	No.	Percentage	P Value
1	Right Radiocephalic	06	06	.043912
2	Left Radiocephalic	43	43	
3	Right Brachiocephalic	01	01	
4	Left Brachiocephalic	50	50	

The chi-square statistic is 4.0599. The *p*-value is .043912. The result is significant at $p < .05$.

Table No. 5: Outcome of AVF creation

S. No.	Type of AVF	No.	Percentage
1	Primary Failure	27	27
2	Successful	73	73

Discussion

The AV fistula is the preferred long-term vascular access foe chronic haemodialysis. due to its prolonged primary potency rates has the fewest imenention and is associated with decreased morbidity and mortality.. Despite being the preferred choice of haemodialysis access[7]. AVE still has a rebtivety high primary failure rate related to various factors. The aim of this study was to determine the outcomes of ANT creation in our institution. It was also paramount to determine the factors that affect the maturation of the created AVE. as these would require careful consideration during creation of the ANT and result eventually in improvement of the outcomes of AVE aeadon in our institution[8].

In comparative studies between Nephrologists and Surgeons result of successful AVF creation have been similar. Four out of eight females had primary failure but it may be due to smaller arterial size in females, as many studies have proven that gender doesn't affect the outcome.

We found normotension (systolic < 120 mmHg) to be strongly associated with AVF failure as low blood flow is predisposing factor for AVF failure as in HEMO study[9]. As expected similar to other studies failure was significantly associated with lesser arterial diameter the minimum diameter on which AVF was successfully created was 1.5 mm, we didn't attempt AVF creation if cephalic vein diameter after proximal compression of arm was less than 2 mm. Different studies have suggested a good correlation between arterial measurement by USG and direct measurement perioperatively; we didn't measure the arterial diameter during surgery. We had successfully created AVF in 3 of 4 calcified radial arteries.

During follow up, the mean arterial and AVF diameter and blood flow had shown progressive increase. Adequate blood flow was achieved in >90% and > 35% patients at two weeks as per UAB criteria and KDOQI criteria respectively for AVF maturation. In a recent study by T Lee

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et al, UAB criteria has more sensitivity in assessing maturation for distal AVF, we suggest early cannulation should be attempted as some authors have been cannulating as early as 10 days after AVF creation[10-12].

The strength of our study is experience of nephrologist from Indian subcontinent in AVF creation, the prospective follow up with ultrasound, encouraging results even in elderlies, calcified and narrow arteries and very short waiting period[13]. The drawback of our study is small size of patients and short duration of follow up and AVF creation limited to distal forearm only.

Clinicians first refer to the physician who created the endoAVF for guidance on cannulation sites. This physician should follow-up with the patient prior to first cannulation, mark the cannulation zone, and review this information with both the patient and the dialysis nurse, as with surgical vascular access patients[14]. Ultrasound should be used to guide cannulation at least for the first cannulation, particularly for obese patients, and a tourniquet should be used at the time of puncture to facilitate vessel access.

Conclusion

AV fistula successful rate was observed was 73%. Angioaccess procedures should not be considered as minor procedures. These operations must be restricted to surgeons with demonstrable interest and experience, or they should at least be carried out under their supervision. Preoperative DUS evaluation should become a routine tool for all vascular access surgeons. Vascular surgeons should be involved in vascular access care as much as possible. To conclude, more nephrologists should be participating in AVF creation thus improving patient care as access creation is not a priority for surgeons.

References

1. Aruny JE, Jennings WC, Lok CE, et al. Percutaneous AVF creation in practice. Endovasc Today.2019;18:30-38.

2. Wasse M, Alvarez AC, Brouwer-Maier D, et al. Patient selection, education, and cannulation of percutaneous arteriovenous fistulae: An ASDIN White Paper. J Vasc Access. October 6, 2019.

3. Singh P, Robbin ML, Lockhart ME, et al. Clinically immature arteriovenous hemodialysis fistulas: effect of US on salvage. Radiology.2007;246:299-305.

4. Lomonte C, Casucci F, Antonelli M, et al. Is there a place for duplex screening of the brachial artery in the maturation of arteriovenous fistulas? Semin Dial. 2005;18:243-246.

5. Planken RN, Tordoir JH, Duijm LE, de Haan MW, Leiner T. Current techniques for assessment of upper extremity vasculature prior to hemodialysis vascular access creation. Eur Radiol. 2007;17:3001–11.

6. Lockhart ME, Robbin ML, Fineberg NS, Wells CG, Allon M. Cephalic vein measurement before forearm fistula creation: does use of a tourniquet to meet the venous diameter threshold increase the number of usable fistulas. J Ultrasound Med. 2006;25:1541–5.

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7. Al-Jaishi, A.A., Oliver, M.J., Thomas, S.M. et al, Patency rates of the arteriovenous fistula for hemodialysis: a systematic review and meta-analysis. Am J Kidney Dis. 2014;63:464–478.

8. Biuckians, A., Scott, E.C., Meier, G.H., Panneton, J.M., Glickman, M.H. The natural history of autologous fistulas as first-time dialysis access in the KDOQI era. J Vasc Surg. 2008;47:415–421 (discussion 420-411).

9. Maintenance and salvage of arteriovenous fistulas. J Vasc Interv Radiol. 2006;17:807–813.

10. Rooijens PP, Burgmans JP, Yo TI, et al. Autogenous radial-cephalic or prosthetic brachial-antecubital forearm loop AVF in patients with compromised vessels? A randomized, multicenter study of the patency of primary hemodialysis access. J Vasc Surg. 2005;42:481–486 (discussions 487).

11. Woodside KJ, Bell S, Mukhopadhyay P, et al. Arteriovenous fistula maturation in prevalent hemodialysis patients in the United States: a national study. Am J Kidney Dis. 2018;71:793-801.

12. Jones RG, Morgan RA. A review of the current status of percutaneous endovascular arteriovenous fistula creation for haemodialysis access. Cardiovasc Intervent Radiol. 2019;42:1-9.

13. Rajan DK, Ebner A, Desai SB, et al. Percutaneous creation of an arteriovenous fistula for hemodialysis access. J Vasc Interv Radiol. 2015/26:484-490.

14. Wasse H. Place of percutaneous fistula devices in contemporary management of vascular access. Clin J Am Soc Nephrol. 2019;14:938-940.