

ORIGINAL RESEARCH

Arterio-Venous Fistulas As A Life Line In Chronic Kidney Disease Patients: A Study In A Tertiary Health Care CentreDr. Sarvesh Sharma¹, Dr. Jitendra Acharya²¹Associate Professor, CTVS department, SP Medical College, Bikaner, Rajasthan, India²Sr.Demonstrator, Department of Dentistry, S.P. Medical College Bikaner, Rajasthan, India**Corresponding author**

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ABSTRACT: -**Background:** - In this study, we share our experiences of arteriovenous fistulas (AVF) creation as vascular access for haemodialysis in chronic kidney disease (CKD) patients.**Materials and methods:** - this study has been done in our hospital from 1Jan. 2019 to 31 Dec. 2021. We created 408 fistulas in 372 patents in forearm and elbow region with minimum follow-up of 6 months to maximum of 3 years.**Observations and results:** - In our study we found that AVFs were having patency in 370(91%) at 6 months, 324(80%) at 1st year, 226(55%) at 2nd year and 140(33%) at 3rd year of completion of surgery. Patients having both bruit and thrill present after surgery showing patency in 305(86.6%) cases at the end of 1st year and 137(38%) at the end of 3rd year. Fistulas having vein diameter less than 2mm showed less patency and only 2(5%) cases were patent fistula after 3years in those cases.**Conclusion:** - in our study we found that presence of thrill and bruit at the time of fistula creation, had more patency rate. Patency rate of fistulas were high in those patients who were having venous diameter more than 2mm than those having venous diameter less than 2mm. Patency of fistulas were less in diabetics in comparison to nondiabetics. There was not any significant difference in long term patency rate of distal or proximal fistulas.**Key words:** Haemodialysis, Chronic kidney disease, Arteriovenous fistulas, Vascular access.**INTRODUCTION:** Chronic kidney disease (CKD) occurs due to irreversible changes to the renal parenchyma with a continuous decrease in kidney functions. End stages renal disease (ESRD) patients need life-long renal replacement therapy either via dialysis or via renal transplant to continue their lives. There are various modes of vascular access for haemodialysis in CKD patients, Viz- Cimino-Brescia fistula (native arterio-venous fistula), prosthetic arterio-venous grafts (AVGs) and central venous catheters (CVCs).The native arterio venous fistula (AVF) is the first choice for vascular access because AVGs and CVCs having more chances of the infectious and thrombotic complications. Brescia and cimino- et al. constructed AVF between distal radial artery and the adjacent vein. Cimion fistula is considered as the best vascular access for haemodialysis (HD).¹

This is a single centre study of experiences of AVF construction in CKD patients, comparing pre operative status of patients associated comorbidities, arterial and venous diameter,

presence or absence of bruit and thrill on operation table, sites of fistula and their outcome in terms of patency and complications.

MATERIALS AND METHODS: This retrospective observational study was conducted in our institute, S.P. Medical college, Bikaner, in CKD Patients who had AVF formation surgery between period of 1 jan. 2019 to 31 dec .2021.

Patients with chronic renal failure (CRF) were diagnosed and advised by nephrologist for AV fistula formations, if their glomerular filtration rate was below desirable. The patients who presented late and were in need of haemodialysis before maturation of fistula, hemodialysis catheter was inserted in them.

Patients were examined thoroughly with detailed history and physical examination. Detailed history of diabetes mellitus, cardiovascular disease, anti-coagulation therapy, previous surgeries, previous dialysis status and access was noted of every patient. In physical examination, general condition and built of patient was examined, pulses and blood pressure measurement, examination of arterial system of both upper arms including allen test, any previous scar mark examination was done. Venous system was also examined for size, edema, collateral veins and for previous central or peripheral venous catheter access. Our preference for AVF creation was on non dominant hand so that patients daily routine work minimally hamper.

Color Doppler study of upper limb arterial and venous system was done for accessing size and patency of vessels in patients to rule out any vascular abnormalities also. Patients and staff were instructed not to prick any vascular access in selected arm for AVF surgery.

In our study 408 fistulas were created in 372 patients. 36 patients were reoperated due to failure of previous fistula. We followed up patients by personal visits of patients, by telephone and collaborations with dialysis staff. Maximum follows up in our study was three years.

SURGICAL PROCEDURE - All patients who underwent AVF creation surgery, were admitted on the day or day before surgery and all necessary investigations were done. All fistulas were created under local anesthesia, using 10-15 cc of 2% xylocaine. After giving skin incision and exposure of vessels, veins and artery were examined for caliber and wall consistency. 5000units of heparin was given intravenously. Distal end of veins was tied and proximal end was beveled. Longitudinal aretriotomy was done of size 6-7 m.m., end to side anastomosis between vein and artery was done 7-0 polypropylene suture. we did radio-cephalic end to side anastomosis in distal and midforearm level. We made antecubital-brachial or basilar-brachial artery fistula in elbow or arm region. Haemostasis achieved, flow through veins examined and distal pulsation felt. Wound was closed with 3-0 ethilone suture in single layer. Dressing was done and bruit was heard and thrill was felt on operation table. In those cases where bruit or thrill was absent, we gave low molecular weight heparin for 3-5 days along with aspirin 75mg, according to creatinine clearance and weight of patients. Patients were discharged on the same day or next day after surgery. With the all instruction given to follow. Patients were asked to take care of operating site and were told to report for any bleeding, swelling coldness, color changes of fingertips or hands, numbness etc. Patient were instructed to do hand ball exercises as advised.

Fistula maturation and its cannulation for use for dialysis was decided by the nephrologist on the basis of visible enlarged veins diameter, depth and thrill. Maturation of fistula usually took 4-6 weeks after surgery.

In our study we obeyed the guide lines by the national kidney foundation disease outcome quality initiative (NKF - K/DOQ1) vascular access clinical practice guidelines 2000².

but we could not follow some guidelines viz. early references, color Doppler ultrasounds in all patients and early assessment of fistula malfunctioning, due to less awareness and poor socioeconomic status of patients admitted in our hospitals.

RESULTS: In our study we created 408 fistulas in our 372 patients of CKD. Out of 372 patients, 232(62.36%) were male and 140 (37.63%) were female. We made fistula on left upper limb in 315 (77%) and on right upper limb in 93 (23%) of cases. We created fistula anastomosis with radial artery in 312 (76%) and with brachial artery in 96(24%) surgeries. In our study lowest age of patients was 14 years and oldest one was 68 years old. 182 (44.6%) cases of fistula were diabetic in our study. Postoperative bleeding was present in 3 patients. Wound infection was present in 3 patients.

Table 1

Basic information about study.

Sr. No.	Information	Number
1	Number of patients	372
2	AVE creation	408
3	Male Patients	232(62.3%)
4	Female Patients	140(37.7%)
5	Fistula cases with diabetes	182(44.6%)
6	Fistulas with Radial artery	312(76%)
7	Fistulas with Brachial artery	96(24%)

In our study out of 408 AVFs, 352 fistulas had bruit and thrill present after surgery and their patency rate was 305 (86.6%) after 1 year, 215(61%) after 2 years and 137 (38%) after 3 years. Cases had both thrill and bruit absent were 40 in number, with having patency 10(25%), 3(7.5%) and 0(0%) after 1,2 and 3 years of surgery. Bruit present and thrill absent in 10 cases out of which 5(50%), 3(30%), 2(20%) cases shows patency after 1,2 and 3 years of surgery. Patients having bruit absent and thrill present were 6 in numbers, after surgery showed patency 4(67%), 4(33%) & 1 (17%) after 1,2&3 years of surgery.

Table 2

Patency rate of fistula with relation to bruit and thrill

Sr. No.	Presence or absence of bruit and thrill	No. of Cases	Patency at One year	Patency at two years	Patency at three years
1	Bruit present, Thrill Present	352	305 (86.6%)	215(61%)	137(38%)
2	Bruit absent thrill absent	40	10(25%)	3 (7.5%)	0 (0%)
3	Bruit present, Thrill Absent	10	5(50%)	3 (30%)	2 (20%)
4	Bruit Absent, Thrill Present	06	4(67%)	2 (33%)	1 (17%)

According to size of artery and vein with patency of fistula in our study, we had 37(9%) patients having vein diameter less than 2mm, they showed patency of fistula in 17(46%), 8(22%) and 2(5%) patients at the end of 1, 2 and 3rd year. In comparison to this venous diameter more

than 2 mm venous diameter were 371(91%), showing patency of 307 (83%) at one year, 216 (58%), and 138 (37%) at the end 2nd & 3rd year respectively.

In comparison to vein, artery diameter showed almost same patency rate after 1st, 2nd and 3rd year, weather having arterial diameter more than 2mm. or less than 2mm. Although artery having diameter more than 2mm showed patency 55% in compassion to 50% patency rate of artery having diameter less than 2mm at the end of 2nd year.

Table 3**Patency of fistula with relation of vessel size**

Sr. No.	Size of Vessel	No. of Cases	Patency at One year	Patency at two years	Patency at three years
1	Vein diameter < 2mm	37 (9%)	17(46%)	8 (22%)	2(5%)
2	Vein diameter > 2mm	371(91%)	307(83%)	216 (58%)	138(37%)
3	arterydiameter< 2mm	34(8.3%)	27(79%)	17(50%)	10(29%)
4	artery diameter > 2mm	374(91.7%)	207(79.4%)	209(55%)	130(35%)

In our study 182(44%) cases were diabetic. They showed less patency of fistula in comparison of non diabetic patients, they showed 126(69%), 64(35%), 22(12%) patency rate at the end of 1st, 2nd & 3rd year of surgery. Non diabetic were having 198(87%), 162 (71%) and 118(52%) patency rate in same time of duration in of 226 patients.

Table-4**Diabetics and fistula patency rate**

Sr. No	patient nature	number of patients	patency after one year	Patency after two years	patency after three years
1	with diabetes	182(44.6%)	126(69%)	64(35%)	22(12%)
2	without diabetes	226(55.4%)	198(87%)	162(71%)	118(52%)

In our study total fistulas were created 408 fistulas, over all patency rate of fistula surgery was 370(91%) at 6 months, 324 (80%) at 1st year, 226 (55%) at 2 year and 140 (33%) at three years completion of surgery.

Table-5**Over all patency rate of fistula with time**

s.no	time duration	number of fistulas	failure	dropout	Patency
1	0 Months	408	0	0	408(100%)
2	6 months	408	38	-	370(90.6%)
3	1 year	370	21	25	324(79.4%)
4	1 ½ year	299	15	18	266(65.1%)
5	2 years	248	12	10	226(55.3%)
6	2 ½ years	216	12	9	195(47.8%)
7	3 years	186	20	26	140(33%)

Discussion- CKD Patients need good vascular access for successful HD. There are various methods for vascular access for HD viz - native AVF, CVGs, and prosthetic arterio-venous grafts. The native AVF creation is the superior choice for vascular access in comparison of CVCs and AVGs as there are more chances of complications like infections, venous stenosis, thrombosis and more damage to vessels in CVC and AVG. It is proved by vast data that native AVFs are superior to grafts for haemodialysis.³

Early detection of dialysis need by nephrologist and advice for AVF creations reduces the need for the temporary dialysis for first few dialysis. CVGs are the first choice for temporary and urgent vascular access. In our study we created AVF in all our chronic kidney disease patients as primary choice of vascular access. Age of general population has been increased over last few decades because of general awareness and medical facilities. It is also seen on the age of onset of ESRD, which has been increased also. In our study average age of patient was 52.5 years. We created distal radio cephalic fistulas in most of patients, which was described by Brescia et.al in 1966¹. Mid forearm and brachial artery fistula were made on only those patients, who had failed previous distal radio cephalic fistula or adequate size of vessels were not available for anastomosis at all distal forearm. We observed that primary patency was higher in proximal fistula as compared to distal ones in our study but we found that it was not much significant difference in term of percentage for long term duration of patency of fistula.

In comparison to our study, Sultan et al⁴ found in their study that patency was better in proximal fistulas for long term duration.

Most studies show 15-30% primary failure rate of distal AVFs. The medical literature reports incidence of primary failure varies from 9%⁵ to 40%⁶. In our study it is also comparable as we are having 20.6% failure rate at the end of one year. In our study we created new fistula for failure cases or venous outflow stenosis.

Coming to vessel diameter, our study showed higher patency rate of fistula having vein diameter > 2mm (83%), in comparison of having vein diameter < 2mm (46%) at the end of one year. However, diameter of artery whether more than 2mm or less than 2 mm showed almost same patency rate of 79% at the end of one year. American institute of ultrasound in medical practice guide line 2011⁷ also tells that venous diameter < 2.5 mm and artery diameter < 2mm are associated with higher failure rates.

A study of case series of 245 patients by kazemzadeh et al⁸ in 2012 showed primary patency of fistulas at 6 months 1,2,3 and 4 years was 79.5%, 70%, 65%, 60.5% and 48% respectively. In our study patency of fistula were 90% at 6 months, 79% at one year, 55% at two year and 33% at three years completion. However early detection of any deterioration of functioning of fistula can help to improve long term patency rate but it is not possible mostly in our scenario due to lack of literacy and socioeconomic status of patient. In our center we performed new fistula in cases where previous fistula was failed or having low flow rates.

In our study we observed that patients with diabetes and CKD had less duration of patency of fistula in comparison to non-diabetics.⁹

We found the duration of patency and flow rate in fistula were higher in those cases who had both bruit and thrill present after surgery. They showed 86.6% patency rate in comparison to 25% of cases, who had absence of both bruit and thrill after surgery at the end of 1st year.

Conclusion: In our study we concluded that: -

1. Bruit and thrill both present at operation table had directly shown more patency duration and flow in fistula.
2. Patients with artery size less than 2 mm showed not much difference in patency rate of fistula in comparison to those having > 2mm diameter.
3. Vein diameter < 2mm showed less long-term patency rate (29.5% at the end of 3rd year) than vein diameter >2 mm (37% patency at the end of 3rd year).
4. Diabetes causes decrease in long term patency and flow of fistula.
5. Primary patency rate in our study was 324 (80%) at one year, 226(55%) at two years and 140(33%) at three years completion of surgery.
6. In our study we did not find much statistical difference in patency for long term duration in between proximal and distal fistulas.

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