

**A RETROSPECTIVE AND PROSPECTIVE STUDY OF OUTCOME OF  
ARTERIOVENOUS FISTULA FOR HAEMODIALYSIS ACCESS**

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**Abstract**

**Introduction:** Autologous arteriovenous fistula (AVF) creation is a common procedure for hemodialysis patients considered as gold standard vascular access. AVF is the backbone of hemodialysis patients and improves the quality of life as compared to other forms of access. The national kidney foundation guidelines recommend assessment and creation of autologous AVF for long-term hemodialysis patients with end-stage kidney disease (ESKD) when eGFR is 15 to 20 mL/1.73 min<sup>2</sup> with progressive poor renal function.

**Materials and Methods:** This study was a one-year retrospective and one-year prospective study conducted in the Department of Cardiothoracic surgery, Siddhartha Medical College, Vijayawada, Andhra Pradesh, India. The retrospective group included all the cases of arteriovenous fistulae for haemodialysis access, done from May 2022 to May 2024. Details were acquired from the patients' medical record. Among these patients those who came for regular haemodialysis to our hospital were followed up for a period of nine months after the initiation of dialysis.

**Results:** A total of 236 arteriovenous fistulae (AVF) were made during the study period. All fistulae were made by end-to-side anastomosis with 6-0 or 5-0 prolene sutures. All cases were followed up for a period of 9 months. Out of the total number of AVF, 130 belonged to the retrospective group and 106 belonged to the prospective group. Out of the 236 AVF made, 206 (87.3%) was for patients with the diagnosis of Chronic Kidney Disease- Stage V.

**Conclusion:** 87.3% AVFs were made in patients with CKD V. The most common co-morbidity was found to be Systemic Hypertension (73.7%). 43.2% of the population had Diabetes Mellitus Type 2; 29.7% had both the diseases co-existing. There was a statistically significant increase in number of late complications of AVF in patients who had Diabetes Mellitus Type 2, Systemic Hypertension and in patients who had both the co-morbidities co-existing (p value- 0.000). Late complications were also found to be more in patients who had a history of IV cannulation and IJV insertion prior to making of the fistula (p value- 0.000).

**Key Words:** Autologous arteriovenous fistula, end-stage kidney disease, Systemic Hypertension.

## INTRODUCTION

Autologous arteriovenous fistula (AVF) creation is a common procedure for hemodialysis patients considered as gold standard vascular access. AVF is the backbone of hemodialysis patients and improves the quality of life as compared to other forms of access.<sup>1</sup> The national kidney foundation guidelines recommend assessment and creation of autologous AVF for long-term hemodialysis patients with end-stage kidney disease (ESKD) when eGFR is 15 to 20 mL/1.73 min<sup>2</sup> with progressive poor renal function.<sup>2</sup>

In 2003, the United States National Vascular Access Improvement Initiative (NVAII) launched Fistula First.<sup>3</sup> This is a large national initiative that offers a set of tools for physicians and dialysis facilities in order to accelerate increasing AVF use in haemodialysis patients.<sup>4</sup> Eleven change concepts guide the target groups step-by-step to the best practice. In Netherlands, the CIMINO-project (Care Improvement by Multidisciplinary approach for Increase of Native vascular access Obtainment) was initiated as an effort to increase AVF use.<sup>5</sup>

This is a descriptive observational study conducted in the Department of Cardiothoracic surgery, Siddhartha Medical College, Vijayawada, Andhra Pradesh, India. The study is to analyse the outcome of arteriovenous access created for haemodialysis in a specific time period.

## MATERIALS AND METHODS

This study was a one-year retrospective and one-year prospective study conducted in the Department of Cardiothoracic surgery, Siddhartha Medical College, Vijayawada, Andhra Pradesh, India. The retrospective group included all the cases of arteriovenous fistulae for haemodialysis access, done from May 2022 to May 2024. Details were acquired from the patients' medical record. Among these patients those who came for regular haemodialysis to our hospital were followed up for a period of nine months after the initiation of dialysis.

The prospective group included all the arteriovenous fistulae done for haemodialysis access from May 2022 to May 2024. All patients were personally worked up and followed up in the ward or on OPD basis. After the clinical assessment, the site of fistula was determined and patients were educated about the need for protecting the selected limb from any type of cannulations or injections. In case of inadequacy of vasculature in both the upper limbs, the same was confirmed by a Duplex examination.

After determination of the appropriate limb for surgery, the procedure was done under local anaesthesia in the operation theatre. Intraoperative heparin saline was used in all cases. All arteriovenous anastomosis were end (vein) to side (artery) and were done by using 6-0 prolene. The fistula created was monitored for a good thrill, pulse and any immediate complication such as bleeding or thrombosis.

After four to six weeks, a fistula with a good thrill was considered to be mature and was subjected to cannulation and then haemodialysis. The fistula flow rate was recorded at initiation of haemodialysis and after four weeks of haemodialysis.

A nine-month follow-up study was done, which included monitoring of the fistula flow rate after four weeks of initiation of haemodialysis. The final outcome of the fistula at the end of nine-month study was measured in terms of duration of successful use, need for creation of a new fistula at another site or need for re-exploration.

The data was entered in Microsoft Excel. The frequencies, proportions and chi-square test was done using SPSS software version 17.

### Inclusion Criteria

1. Patients with chronic renal failure who required a permanent haemodialysis access.
2. Patients with chronic renal failure who already had any other type of haemodialysis access, but needed a permanent arteriovenous fistula.
3. Patients with chronic renal failure who had a failed previous arteriovenous access.

### Exclusion Criteria

1. Patients with inadequate peripheral vascular system in both upper limbs. The exclusion was done by clinical assessment and Duplex study.

## RESULTS

A total of 236 arteriovenous fistulae (AVF) were made during the study period, all by experienced surgeons in the vascular unit of the department. All fistulae were made by end-to-side anastomosis with 6-0 or 5-0 prolene sutures. All cases were followed up for a period of 9 months. Out of the total number of AVF, 130 belonged to the retrospective group and 106 belonged to the prospective group. Out of the 236 AVF made, 206 (87.3%) was for patients with the diagnosis of Chronic Kidney Disease- Stage V.

Retrospective Group	130
Prospective Group	106
Total No. of AVF	236

**Table 1: Grouping of Study Population**

Diagnosis	Number	Percentage
Chronic Kidney Disease (CKD)- Stage V	206	87.3%
CKD- Stage IV	12	5.08%
Obstructive Uropathy	10	4.23%

CKD- Stage III	8	3.38%
Total	236	100%

**Table 2: Diagnosis of the Study Population**

Comorbid Illness	Number	Percentage
Diabetes Mellitus Type 2	102	43.2%
Systemic Hypertension	174	73.7%
Coronary Artery Disease	22	9.32%
Respiratory Disease	2	0.8%
Congestive Cardiac Failure	4	1.7%
DM Type 2 + Systemic Hypertension	70	29.7%
DM Type 2 + Systemic Hypertension + CAD	10	4.2%
Systemic Hypertension + CAD	10	4.2%
DM Type 2 + CAD	2	0.8%
HBsAg Positive	2	0.8%
Others	14	5.9%
None	20	8.5%

**Table 3: Comorbidities in the Study Population**

Past History	Number	Percentage
Use of Anticoagulants	2	0.8%
Previous AVF	20	8.47%
IV Cannulation of Upper Limb Veins	4	1.7%
IV Cannulation + IJV insertion	208	88.1%
IV Cannulation + IJV insertion + Previous AVF	16	6.8%
Smoking	10	4.2%
Anaemia	168	71.2%
Peripheral Vascular Disease	0	0%

**Table 4: Relevant Past History of the Study Population**

Type of Fistula	Number	Percentage
Left Radiocephalic	104	44.1%
Left Brachiocephalic	88	37.3%
Right Radiocephalic	22	9.3%
Right Brachiocephalic	16	6.8%
Left Brachiobasilic	2	0.8%
Right Brachiobasilic	2	0.8%
Left Brachiocubital	2	0.8%
Total	236	100%

**Table 5: Type of Arteriovenous Fistula**

Early Re-Exploration	Number	Percentage
Fistula working post exploration	20	8.5%
Fistula not working post exploration	10	4.2%
Total	30	12.7%

**Table 6: Early Re-Exploration of AVF**

Outcome	Number	Percentage
Successful Fistula	148	62.7%
Non-Functional Fistula	50	21.2%
New Fistula made at another site	36	15.3%
Lost to follow-up	2	0.8%
Total	236	100%

**Table 7: Outcome of AVF**

The total number of AVFs that were functioning successfully at the end of the 9-month follow-up period was 148 (62.7%); 50 became non-functional and in 36 cases a new fistula had to be made at another site. Two cases was lost to follow-up.

## DISCUSSION

Access to the vascular system is necessary in patients with chronic renal failure planned to undergo dialysis. The gold standard for chronic dialysis has become the native arteriovenous fistula (AVF) since 1966 when Brescia and associates constructed a fistula between the radial artery and the cephalic vein.<sup>6</sup>

There were a total of 236 AVF made in the study period. Out of this study population, 130(55.08%) belonged to the retrospective group and 106 (44.92%) belonged to the prospective group.

In this study, 87.3% of the AVF were made in patients with Chronic Kidney Disease (CKD)-stage V; 3.38% of the study population was in CKD IV stage and 1.69% in stage III.<sup>7</sup>

In a single centre study, clinical and epidemiological data obtained from Shanghai First People's Hospital Affiliated to Jiaotong University, 376 patients were included, all undergoing haemodialysis through a native arteriovenous fistula. The most common cause of renal failure in this study population was chronic glomerulonephritis (68.62%). In another study by Kazemzadeh GH et al published in 2012, diseases detected in 10.6% of patients included glomerulonephritis, polycystic kidney, uropathy, pyelonephritis and lupus erythematosus.<sup>8</sup>

In a study conducted in Brazil in 2008, 154 out of 219 patients (86%) with arteriovenous access had hypertension as a pre-existing co-morbidity. These results are comparable to the present

study, emphasising the prevalence of systemic hypertension in renal failure patients undergoing haemodialysis.<sup>9</sup>

84.74% of the arteriovenous fistulae made were used successfully for at least 3 months. 69.4% worked for 6 months and 62.7% worked successfully for 9 months.

Chemla's team in London, UK, performed 552 AVFs in 4 years achieving a primary patency rate at 22 months of 80% in 153 patients with radiocephalic fistulas.<sup>10</sup>

## CONCLUSION

87.3% AVFs were made in patients with CKD V. The most common co-morbidity was found to be Systemic Hypertension (73.7%). 43.2% of the population had Diabetes Mellitus Type 2; 29.7% had both the diseases co-existing. There was a statistically significant increase in number of late complications of AVF in patients who had Diabetes Mellitus Type 2, Systemic Hypertension and in patients who had both the co-morbidities co-existing (p value- 0.000). Late complications were also found to be more in patients who had a history of IV cannulation and IJV insertion prior to making of the fistula (p value-0.000). There was no association of smoking or anaemia with development of late complications in the AVFs. 97.5% of cases demonstrated a good thrill in the immediate postoperative period, whereas 2.5% had only a demonstrable pulse. Early re-exploration, i.e. re-exploration before maturation of fistula was required in 12.7% of cases. The primary failure rate was 4.2%. The average time taken for maturity of the AVF was 4 to 6 weeks.

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