

Clinico-Etiological Profile and Management of Arteriovenous Fistula Blowouts in Hemodialysis Patients: A Retrospective Single-Center Observational Study

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Abstract

Background: Arteriovenous fistula (AVF) blowout is a rare but life-threatening complication of hemodialysis access. This study evaluated the clinico-etiological profile, management, and outcomes of AVF blowouts. **Material and Methods:** A retrospective observational study was conducted at Kurnool Medical College between January 2020 and December 2025. Patients presenting with AVF blowouts requiring surgical intervention were included. Demographic data, etiology, management, and outcomes were analyzed using descriptive statistics. **Results:** Twenty-five patients were included. The mean age was 48.8 years, and 68% were male. Pseudoaneurysm was the most common etiology (56%), followed by infection (24%). Active bleeding occurred in 76% of patients. AVF ligation was performed in 22 patients (88%), while salvage by excision and primary repair was attempted in three patients, with successful preservation in two (66.7%). No mortality or rebleeding was observed during 1–3 years of follow-up. **Conclusion:** Pseudoaneurysm and infection are the leading causes of AVF blowouts. Emergency surgery provides effective hemorrhage control, while AVF salvage is feasible in selected patients.

Keywords: Arteriovenous fistula; Hemodialysis; Pseudoaneurysm; Blowout; Vascular access; Salvage repair.

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INTRODUCTION

For maintenance hemodialysis, native arteriovenous fistula (AVF) is the site of choice.

Due to its high patency and limited risk of infection when compared to other access modalities.^[1]

But AVFs can have complications such as stenosing, aneurysm, and/or infection.

The three stages are formation, pseudoaneurysm and rupture. AVF blowout is a very uncommon but serious.^[2,3]

Can cause massive bleeding. Repeated Cannulation, Infection and trauma, Vessel wall However, aneurysm formation and rupture relate in some way to degeneration, and, although clinically important, the problem has not been studied. Rare studies have been done on the blowouts of AVF in developing countries, especially in Africa. countries. This study aimed to evaluate the clinico-etiological profile, management strategies, and outcomes of AVF blowouts in patients undergoing maintenance hemodialysis at a tertiary care center in South India.^[4-6]

MATERIALS AND METHODS

This retrospective observational study was conducted in the Department of Urology, Kurnool Medical College, Andhra Pradesh, India, from January 2020 to December 2025 after Institutional Ethics Committee approval (No. 1011/2025). The requirement for informed consent was waived owing to the retrospective design.

Patients undergoing maintenance hemodialysis who presented with AVF blowout requiring surgical intervention were included. Patients with incomplete records, central venous catheter-related bleeding, or arteriovenous graft complications were excluded.

Data collected included demographic characteristics, comorbidities, dialysis vintage, AVF characteristics, etiology and presentation of blowout, prior interventions, operative management, microbiological findings, alternative dialysis access, and follow-up outcomes. AVF blowout was defined as rupture of an established AVF causing active bleeding, sentinel bleeding, or threatened rupture requiring surgery. Etiology was determined clinically.

Emergency surgical intervention was individualized according to local findings. AVF ligation was Used in patients who have uncontrolled bleeding, extensive tissue destruction or severe infections.

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In patients, a selective attempt was made to salvage by removing the affected segment, and providing primary closure where appropriate.

If AVF ligation was done, temporary IJV catastrophe was done for dialysis.

For 1-3 years thereafter, the rate of salvage success and complications, and rebleeding were assessed in patients mortality. Descriptive statistics were used to analyze the data and it was presented in MS Excel in the form of mean. Compose and report range, median values or frequencies or percentages as appropriate.

RESULTS

Twenty-five patients met the inclusion criteria. The mean age was 48.8 years (range, 38–70 years), with 17 (68%) males and 8 (32%) females. Diabetes mellitus and hypertension were present in 21 (84%) and 20 (80%) patients, respectively. The mean dialysis vintage was 3.4 years, and the median AVF duration before blowout was 2.3 years. Left-sided AVFs accounted for 16 (64%) cases, while 12 (48%) were radiocephalic and 13 (52%) were brachiocephalic fistulas [Table 1].

Table 1: Baseline characteristics of study participants (n = 25)

Variable	Value
Mean age, years (range)	48.8 (38–70)
Male sex, n (%)	17 (68)
Female sex, n (%)	8 (32)
Diabetes mellitus, n (%)	21 (84)
Hypertension, n (%)	20 (80)
Mean dialysis vintage, years	3.4
Median AVF duration before blowout, years	2.3
Left-sided AVF, n (%)	16 (64)
Right-sided AVF, n (%)	9 (36)
Radiocephalic AVF, n (%)	12 (48)
Brachiocephalic AVF, n (%)	13 (52)

Pseudoaneurysm was the commonest etiology of AVF blowout, occurring in 14 (56%) patients, followed by infection in 6 (24%). Repeated cannulation and trauma each

accounted for 2 (8%) cases, while other causes were identified in 1 (4%) patient [Table 2].

Table 2: Etiology and Clinical Presentation of Arteriovenous Fistula Blowout (n = 25)

Variable	n (%)
Etiology	
Pseudoaneurysm	14 (56)
Infection	6 (24)
Repeated cannulation	2 (8)
Trauma	2 (8)
Other causes	1 (4)
Clinical presentation	
Active bleeding	19 (76)
Sentinel bleeding	4 (16)
Hemodynamic instability	2 (8)
Skin thinning/ulceration	6 (24)

Active bleeding was the predominant presentation, occurring in 19 (76%) patients. Sentinel bleeding and hemodynamic instability were observed in 4 (16%) and 2

(8%) patients, respectively. Skin thinning or ulceration was present in 6 (24%) patients.

Table 3: Management, microbiological findings, and outcomes

Variable	Value
Prior angioplasty, n (%)	4 (16)
Prior surgical revision, n (%)	8 (32)
AVF ligation, n (%)	22 (88)
AVF salvage by excision and primary repair, n (%)	3 (12)
Successful salvage among attempted repairs, n (%)	2/3 (66.7)
Temporary IJ catheter following ligation, n (%)	22 (88)
Culture-positive infections, n	3
Staphylococcus aureus, n	2
Klebsiella species, n	1
Culture-negative infections, n	3
Follow-up duration	1–3 years
Rebleeding, n (%)	0
Mortality, n (%)	0
Major postoperative complications, n (%)	0

Previous angioplasty and surgical revision had been performed in 4 (16%) and 8 (32%) patients, respectively. AVF ligation was undertaken in 22 (88%) patients, whereas salvage by excision and primary repair was attempted in 3 (12%) patients, including two brachiocephalic and one radiocephalic fistula. Salvage was successful in two patients (66.7%). Temporary internal jugular venous catheters were used following AVF ligation.

Among the six patients in whom infection was considered the primary etiology, microbiological cultures of debrided tissues were positive in three cases, yielding *Staphylococcus aureus* in two patients and *Klebsiella* species in one patient. The remaining three patients had negative cultures despite clinical evidence of infection.

During a follow-up period of 1–3 years, no major postoperative complications, rebleeding episodes, or mortality were observed.

DISCUSSION

AVF blowout is an uncommon but potentially life-threatening complication of hemodialysis vascular access that requires prompt surgical intervention. In the present study, pseudoaneurysm formation was the most common etiological factor (56%), followed by infection (24%). Repeated cannulation, progressive venous wall degeneration, and hemodynamic stress may contribute to pseudoaneurysm formation and eventual rupture. Similar observations have been reported in previous studies highlighting aneurysmal degeneration as a major risk factor for AVF rupture.^[4] Infection was the second leading cause of AVF blowout in our cohort. Vascular access infection: Infection which makes the vessel weaker.^[7]

Culture- to allow destruction of inflammatory tissue and create walls that will make the risk of rupture higher.

No organism was cultured from the positive infections except *Staphylococcus aureus*. predominant organism. Of the remaining 3, all were negative although there was clinical evidence. Of infection, due to perhaps past antibiotic application. Most of the patients were having active bleeding, Highlighting that this is a process that is ongoing. Early warning signs such as sentinel bleeding, If pseudoaneurysms size suddenly increases, skin thins out and develops ulcers, it is an urgent indication for surgical intervention.^[8]

Evaluation to prevent catastrophic bleeding. Ligation of the AVF was the most common Treatment strategies (88%) that resulted in effective hemorrhage control. This is congruent with As shown in previous reports, extensive infection or tissue breakdown or uncontrolled bleeding can be caused by this disease.^[9]

Often times salvage by excision and primary repair is required for AVF. Of these selected patients, a test was conducted and 66.7% of them were successful after the application of the was. Although preservation of Therefore, vascular access could be able to reduce its reliance on any other catheter and it could also save on future use of access points should. be saved for patient with localized disease, good anatomy and without extensive involvement.

infection.

The KDOQI 2019 Clinical Practice Guideline suggests that the evaluation of aneurysmal should be done promptly.^[10]

Pseudoaneurysmal access may present with a sensation of pain, rapid growth and/or skin thinning, and is an indication.

We used a treatment strategy similar to these. Treatment shall include surgical intervention (ligation preferred, if there is a significant infection or tissue compromise).

Waste and salvage only done when deemed necessary. No mortalities or rebleeding was noted in follow up the authors commented that no symptoms were found indicative of early referral, timely surgery or follow up.

Good results can be obtained with appropriate post-operative monitoring. Due to the fact that diabetes is prevalent in the area. The proportion of vascular comorbidities in our cohort of mellitus and hypertension is representative of the high level of vascular comorbidities.

Especially in end stage renal disease (ESRD) dialysis patients, can be a source of access-related complications. Overall, Our findings underscore the importance of often monitoring AVF, educating patients about risks of AVF, Signs to warn, and prompt surgical correction. information about the identification of high risk lesions at an early stage could. To prevent catastrophic haemorrhages and improve access to patient's vessels undergoing maintenance hemodialysis. Early recognition of alarming symptoms (e.g. sentinel bleeding), an increased probability of pseudoaneurysms. Consideration should be given to the potential for pseudoaneurysms and enlarging pseudoaneurysms to encourage referrals early, thereby reducing risk of pseudoaneurysms.

catastrophic hemorrhagic events. Salvage procedures should be performed on a selective basis on appropriate surgical candidates.

Created and sold to PWC, so that patients are assured of access to the same watercraft in the future.

Limitations

The retrospective design, single center and the small sample size restrict the transference of the results. Further, no comparison group was provided and there was a limited number of time periods.

Detailed analysis of factors related to AVF success was only possible in a handful of AVF salvage procedures access preservation.

CONCLUSION

AVF blow out is rare but life threatening complication of patients on maintenance hemodialysis. They are most often caused by the development of pseudoaneurysms and infection. Emergency

In most cases, surgical treatment is effective, primarily in the form of ligation of the AVF, which stops bleeding, excellent outcomes. Salvage procedure can be achieved after a salvage performed by an AVF with an excision technique and primary repair in carefully selected patients selected patients.

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Conflicts of interest

There are no conflicts of interest.

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