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POSTOPERATIVE DRUG REGIMEN FOR AVF -A COMPARATIVE STUDY TO EVALUATE THE EFFICACY OF ANTIPLATELETS AND ANTICOAGULANTS TO IMPROVE PATENCY OF AV ACCESS

DR S DEVI PRIYA[1], DR SANTHOSH VR[2], DR RENUKA PALADUGULA[3], DR.K.PADMAVATHY[4]
*CORRESPONDING AUTHOR DR MARUN RAJ G
[123]DEPARTMENT OF VASCULAR SURGERY, SAVEETHA MEDICAL COLLEGE AND HOSPITAL
[4]PROFESSOR, DEPARTMENT OF MICROBIOLOGY, SREE BALAJI DENTAL COLLEGE & HOSPITAL, CHENNAI, INDIA

ABSTRACT

Background: Arteriovenous fistula (AVF) is the preferred vascular access for haemodialysis in patients with chronic renal failure. However, early AVF failure due to thrombosis and inadequate maturation remains a significant challenge in haemodialysis. This study aimed to compare the efficacy of antiplatelet and anticoagulant therapies in improving AVF patency.

Methods: In this prospective comparative study, 156 patients were randomly allocated to three groups: Group 1 received aspirin (75 mg), Group 2 received aspirin (75 mg) plus acitrom (1 mg), and Group 3 received clopidogrel (75 mg). Medications were initiated on postoperative day 1. Clinical and ultrasonographic assessments were performed at 2, 4, 6, and 12 weeks. The primary outcome was AVF patency at 12 weeks postoperatively. Secondary outcomes included thrombosis, early cannulation feasibility and complications.

Results: At 12 weeks, patency was highest in Group 2 (84.6%), followed by Group 1 (73.1%) and Group 3 (67.3%). Thrombosis was least frequent in Group 2 (9.6%), while Group 1 reported 21.2%, and Group 3 had the highest incidence at 26.9%. Early cannulation feasibility was highest in Group 2 (78.8%). Minor and major bleeding events were more common in Group 2 (13.5% and 3.8%, respectively). Surgical site infections and haematoma formation were most frequent in group 3.

Conclusion: The combination of aspirin and acitrom led to the best outcomes in maintaining AVF patency and reducing thrombosis risk at 12 weeks. However, this regimen carries a higher risk of bleeding complications. Patient-specific risk factors must be considered when choosing a postoperative regimen to balance efficacy and safety of the treatment.

Keywords: Arteriovenous fistula, antiplatelet therapy, anticoagulant therapy, patency, thrombosis,

INTRODUCTION

Arteriovenous fistula (AVF) remains the gold standard vascular access for haemodialysis in patients with chronic renal failure (CRF) because of its superior long-term patency, lower infection rates, and overall cost-effectiveness compared to grafts or central venous catheters.[1,2] However, despite these advantages, AVF maturation failure and early thrombosis continue to present significant clinical challenges, often necessitating repeated interventions or a transition to alternative access methods.[3] The failure rate of AVF within the first three months of creation has been reported to range from 20% to 50%, primarily due to thrombosis, inadequate vessel remodelling, or neointimal hyperplasia.[4,5] Given these complications, optimising postoperative pharmacologic strategies to maintain AVF patency is crucial for this vulnerable patient group.

In the early postoperative period, thrombus formation primarily results from endothelial injury, altered haemodynamics, and a prothrombotic state associated with uraemia.[6] To address this issue, clinicians have investigated antithrombotic therapy, including antiplatelet and anticoagulant therapy, as a strategy to enhance fistula survival. Antiplatelet agents inhibit platelet aggregation, which is a critical factor in the development of AVF thrombosis. Several studies have suggested that short-term antiplatelet therapy may reduce the incidence of early AVF failure.[7,8,9] However, the data are heterogeneous, and this approach is not universally adopted in clinical practice because of variations in patient response and bleeding risk.[8]

Anticoagulants, including low-molecular-weight heparin and warfarin, are designed to target the coagulation cascade and may provide enhanced protection against thrombus formation, particularly in patients with a

hypercoagulable profile.[10] However, their use is often constrained by an increased risk of bleeding complications, particularly during the early postoperative period, when vessel integrity may be compromised. Furthermore, anticoagulant therapy requires careful monitoring and individualised dosing to prevent adverse outcomes, raising concerns regarding its practicality in routine AVF care.[11,12]

Despite the growing interest in pharmacological prophylaxis following AVF creation, there is a lack of consensus regarding the optimal regimen that effectively balances efficacy and safety of the treatment. This uncertainty is reflected in diverse clinical practice patterns and limited recommendations. Notably, there is a lack of comparative data directly evaluating antiplatelet versus anticoagulant therapy in terms of AVF patency, bleeding risk, patient comfort, and cost-effectiveness.

Aim

This study aimed to investigate the comparative efficacy of antiplatelet and anticoagulant therapy in improving the primary patency rate of AVF in patients undergoing haemodialysis.

MATERIALS AND METHODS

This prospective hospital-based comparative study was conducted in 156 patients with varicose veins and perforator incompetence at the Department of Vascular Surgery, Saveetha Medical College and Hospital, for a period of 2 years (March 2023 to March 2025). The study was approved by the Institutional Ethics Committee (IEC), and informed consent was obtained from all patients before the study initiation.

Inclusion and exclusion criteria

This study included patients aged >18 years with CRF requiring haemodialysis and suitable vascular conditions for AV access. Patients with severe systemic infections, haematologic diseases affecting coagulation, liver cirrhosis, active bleeding disorders, a history of major organ bleeding, or recent surgery within the past six months, pregnant patients, those with a platelet count <100,000/mm³, and those unwilling to participate were excluded from the study.

Methods

Patients (n=156) were randomly allocated to one of three treatment groups. Group 1 (n=52) was administered a postoperative regimen of tab Ecosprin 75 mg once daily, commencing on postoperative day (POD) 1, provided that there were no contraindications to antiplatelet therapy. Group 2 (n=52) received 75 mg of enteric-coated aspirin (Ecosprin) and 1 mg of acitrom once daily, with both antiplatelet and anticoagulant therapies initiated on POD 1, subject to the same safety criteria. Group 3 (n=52) received tab Clopilet 75 mg once daily, starting on POD 1, under similar conditions.

Comprehensive patient data were collected at baseline. Demographic variables, including age, sex, and diabetes duration, were documented. A detailed medical history was recorded, focusing on comorbidities such as hypertension, dyslipidaemia, cardiovascular disease, and previous thrombotic events. Baseline wound characteristics, including location, size, and depth at the surgical site, were assessed. The wound area was measured using standardised techniques such as digital photography and planimetry to ensure consistency. Additionally, blood samples were collected for laboratory investigations, including glycated haemoglobin (HbA1c) and lipid profiles, to provide insight into the patients' metabolic status at the time of surgery. All medications were administered orally, and adherence was monitored throughout the follow-up period of the study. Follow-up assessments were conducted at weeks 2, 4, and 6, continuing until the patient's first arteriovenous fistula (AVF) cannulation for haemodialysis, and extending through week 12 postoperatively. Clinical and ultrasonographic evaluations were performed at each follow-up visit. Duplex ultrasound was used to assess AVF patency and measure the vein diameter. Any indications of local inflammation, erythema or bleeding were documented. Patients were requested to provide feedback on their experiences, including comfort and satisfaction with the assigned antithrombotic regimen. All adverse events, including potential complications such as infection, haematoma, or signs of over-anticoagulation, were meticulously recorded.

Data were collected using standardised case report forms. The primary outcome of the study was to evaluate AVF patency, the feasibility of early cannulation, and the incidence of thrombosis at various time intervals: immediately postoperatively and at 1, 3, 6, and 12 weeks postoperatively. Secondary outcomes included the assessment of postoperative complications, such as surgical site infections, hematoma formation, and the requirement for secondary interventions to maintain or restore AVF function.

Statistical analysis

Data were presented as mean, standard deviation, frequency and percentage. Continuous variables were compared using the independent sample t-test. Categorical variables were compared using the Pearson chi-square test. Significance was defined by P values less than 0.05 using a two-tailed test. Data analysis was performed using IBM SPSS version 21.0.

RESULTS

The mean age of patients was highest in Group 3 (57.1 ± 9.7 years), followed by Group 1 (56.4 ± 10.2 years) and Group 2 (55.7 ± 11.5). Male patients constituted 59.6% of Group 1, 57.7% of Group 3, and 55.8% of Group 2, whereas female patients comprised 40.4% of Group 1, 42.3% of Group 3, and 44.2% of Group 2. The proportion of patients with diabetes was highest in Group 3 (57.7%), followed by Group 1 (53.8%) and Group 2 (50%). Similarly, the prevalence of hypertension was highest in Group 1 (61.5%), followed by Group 3 (59.6%) and Group 2 (57.7%) (Table 1).

Table 1: Comparison of demographic and clinical characteristics between groups

		Group 1	Group 2	Group 3
Age (in years)		56.4 ± 10.2	55.7 ± 11.5	57.1 ± 9.7
Sex	Male	31 (59.6%)	29 (55.8%)	30 (57.7%)
	Female	21 (40.4%)	23 (44.2%)	22 (42.3%)
Co morbidities	Diabetic (%)	28 (53.8%)	26 (50%)	30 (57.7%)
	Hypertensive (%)	32 (61.5%)	30 (57.7%)	31 (59.6%)

The mean HbA1c level was highest in Group 3 (7.3 ± 1.2%), followed by Group 1 (7.2 ± 1.1%) and Group 2 (7.0 ± 1.0%). Total cholesterol levels were also highest in Group 3 (192 ± 33 mg/dL), followed by Group 1 (189 ± 35 mg/dL) and Group 2 (185 ± 30 mg/dL). LDL levels followed a similar pattern, with Group 3 showing the highest values (123 ± 24 mg/dL), followed by Group 1 (120 ± 22 mg/dL) and Group 2 (118 ± 21 mg/dL). The mean platelet count was highest in Group 2 (215 ± 38 × 10^3/mm^3), followed by Group 1 (210 ± 35 × 10^3/mm^3) and Group 3 (208 ± 33 × 10^3/mm^3). CRP levels were highest in Group 3 (4.3 ± 1.0 mg/L), followed by Group 1 (4.1 ± 0.9 mg/L) and Group 2 (3.9 ± 0.8 mg/L) (Table 2).

Table 2: Comparison of laboratory parameters between groups

	Group 1	Group 2	Group 3
HbA1c (%)	7.2 ± 1.1	7.0 ± 1.0	7.3 ± 1.2
Total Cholesterol (mg/dL)	189 ± 35	185 ± 30	192 ± 33
LDL (mg/dL)	120 ± 22	118 ± 21	123 ± 24
Platelet Count (10^3/mm^3)	210 ± 35	215 ± 38	208 ± 33
CRP (mg/L)	4.1 ± 0.9	3.9 ± 0.8	4.3 ± 1.0

At 12 weeks, patency was highest in Group 2 (84.6%), followed by Group 1 (73.1%) and Group 3 (67.3%). Thrombosis was least frequent in Group 2 (9.6%), while Group 1 reported 21.2%, and Group 3 had the highest incidence at 26.9%. Early cannulation feasibility was highest in Group 2 (78.8%), followed by Group 1 (63.5%) and Group 3 (59.6%). Minor bleeding events were more common in Group 2 (13.5%) than in Group 1 (3.8%) and Group 3 (1.9%). Major bleeding events occurred only in Group 2 (3.8%), with no such events in Groups 1 or 3. Surgical site infections were reported in three patients in Group 3, two in Group 1 (3.8%), and one in Group 2 (1.9%). Hematoma formation was most frequent in Group 3 (7.6%), followed by Group 1 (5.7%) and Group 2 (3.8%) (Table 3).

Table 3: Comparison of clinical outcomes and complications between groups

	Group 1	Group 2	Group 3
Patency at 12 weeks (%)	38(73.1%)	44(84.6%)	35(67.3%)
Thrombosis (%)	11(21.2%)	5(9.6%)	14(26.9%)
Early Cannulation Feasibility (%)	33(63.5%)	41(78.8%)	31(59.6%)
Minor Bleeding Events	2 (3.8%)	7 (13.5%)	1 (1.9%)
Major Bleeding Events	0	2 (3.8%)	0
Surgical Site Infection	2(3.8%)	1(1.9%)	3
Hematoma Formation	3(5.7%)	2(3.8%)	4(7.6%)

DISCUSSION

In our study, the baseline demographic characteristics, such as age, sex distribution, and prevalence of common comorbidities such as diabetes mellitus and hypertension, were comparable across the three treatment groups. This comparability suggests a balanced distribution of potential confounding factors, thereby enhancing the internal validity of the study outcomes by minimising baseline variability, which could otherwise affect the results. Additionally, the baseline clinical investigation parameters, including glycaemic control (indicated by HbA1c), lipid profiles (total cholesterol and LDL levels), platelet counts, and inflammatory markers (CRP), were consistent across all the groups. This further supports the conclusion that the participants entered the study with broadly similar clinical and biochemical profiles, enabling a more reliable comparison of the intervention effects.

Upon evaluating the outcomes directly associated with the study objectives, variations were observed among the groups concerning AVF patency rates at 12 weeks, incidence of thrombosis, and feasibility of early cannulation. These parameters are critical for determining the clinical success of arteriovenous fistula maturation and its functionality. The observed differences indicate that the type and combination of antiplatelet therapy may significantly influence both vascular patency and the timing of fistula use. Notably, certain regimens appeared more advantageous in maintaining fistula patency and reducing thrombotic events, which are essential for ensuring uninterrupted dialysis. The occurrence of minor and major bleeding events varied between the groups, highlighting the differences in bleeding risk associated with each antiplatelet strategy. Furthermore, surgical site infections and haematoma formation, both pertinent postoperative complications, were also observed to differ, albeit without a dominant pattern.

Dember et al. conducted a large multicentre RCT (the Dialysis Access Consortium [DAC] study) examining clopidogrel versus placebo for AVF patency. They found that clopidogrel reduced early AVF thrombosis (12.2% vs. 19.5%, p=0.001) but did not significantly improve long-term patency, aligning with our observation that clopidogrel alone (Group 3) had the lowest patency at 12 weeks.[13]**Yen et al.** concluded that antiplatelet medication after surgical thrombectomy for AV fistula occlusion in haemodialysis patients reduces recurrent thrombosis but jeopardises fistula longevity.[14]**Palmer et al.** concluded that antiplatelet agents reduce early AVF failure but increase bleeding risk, supporting our finding that aspirin-based regimens improve patency but carry a bleeding risk, especially when combined with anticoagulants.[15]

Our findings are consistent with those of **Rouzrokh et al.**, who showed that antiplatelet therapy significantly improved AVF patency rates and reduced thrombosis without a notable increase in bleeding complications among patients undergoing haemodialysis. While their study focused on antiplatelet monotherapy (aspirin or dipyridamole) versus no therapy, our results extend this evidence by showing that combination therapy (aspirin plus acitrom) further enhances patency rates but at the expense of an increased bleeding risk. This highlights the importance of balancing efficacy and safety when selecting pharmacologic strategies for AVF maintenance.[16]

Our results align with those of **Ebertz et al.**, who found that both single and dual antiplatelet therapies significantly improved one-year arteriovenous graft patency and overall survival compared to no antiplatelet therapy. Their study supports the benefit of antiplatelet agents in maintaining vascular access, similar to our observation that antiplatelet regimens enhance AVF patency rates. Theyfocused on grafts and included dual antiplatelet therapy, our study extends these findings to AVFS and demonstrates that combination therapy with an anticoagulant further increases patency but also raises bleeding risk.[17]

Limitations:

The small sample size of this study may affect the robustness and generalisability of the findings. A larger sample would provide more significant results; however, recruitment and resource constraints posed limitations in this study. The single-centre design restricts the applicability of the results due to specific institutional practices and demographics.

CONCLUSION

Our study showed that combining an antiplatelet (aspirin) with an anticoagulant (acitrom) led to the best outcomes in maintaining AVF patency and reducing the risk of thrombosis at 12 weeks postoperatively. Group 2 had the highest patency rate and the greatest chance of early cannulation. However, this group also experienced more minor and major bleeding events than the other two groups. Aspirin alone (Group 1) showed better results than clopidogrel alone (Group 3); however, both were less effective than combination therapy. These findings suggest that although dual therapy offers better protection against AVF failure, it is also associated with a higher risk of bleeding. Therefore, patient-specific risk factors must be considered when choosing a postoperative regimen to balance the efficacy and safety of the treatment.

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