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Original Research Article

Effect of Postoperative Low-Dose Aspirin on Early Maturation and Short-Term Outcomes of Autogenous Arteriovenous Fistulas in Patients Undergoing Haemodialysis: A Prospective Comparative Study from a Tertiary Care Centre in Bihar, India

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Abstract

Background: Autogenous arteriovenous fistula (AVF) is the preferred vascular access for maintenance haemodialysis because of its better long-term patency and lower complication rates. However, early AVF failure due to thrombosis and delayed maturation remains a common problem. Aspirin may reduce platelet aggregation and improve early fistula maturation, but its routine postoperative use remains uncertain, particularly in the Indian population.

Objective: To evaluate the effectiveness and safety of postoperative aspirin therapy on early maturation of newly created autogenous arteriovenous fistulas.

Methods: A prospective comparative study was conducted in the Department of Plastic Surgery at a tertiary care hospital in Bihar (PMCH, Patna) from July 2025 to June 2026. Forty patients with end-stage renal disease undergoing first-time autogenous AVF creation were enrolled. Patients were divided into two groups. Group A (n=20) received aspirin 75 mg once daily for six weeks after surgery, while Group B (n=20) received standard postoperative care without aspirin.

Results: The mean age of patients was 46.8±11.2 years in the aspirin group and 48.5±10.4 years in the control group. Successful AVF maturation occurred in 18 patients (90%) receiving aspirin compared with 14 patients (70%) in the control group (p=0.048). Early thrombosis developed in one patient (5%) in the aspirin group versus four patients (20%) in controls. Mean AVF blood flow at six weeks was significantly higher in the aspirin group (712±118 mL/min) than controls (624±109 mL/min; p=0.031). No major bleeding episodes were observed.

Conclusion: Postoperative low-dose aspirin appears to improve early AVF maturation and reduce thrombosis without increasing significant bleeding complications. Larger multicentre randomized studies are required to confirm these findings.

Keywords: Arteriovenous Fistula; Aspirin; Haemodialysis; Early Maturation; End-Stage Renal Disease; Vascular Access.

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Introduction

Chronic kidney disease (CKD) is a major health problem worldwide, and the number of patients progressing to end-stage renal disease (ESRD) is increasing every year. Many of these patients require long-term haemodialysis for survival. A well-functioning vascular access is essential for effective haemodialysis. Among the available vascular access options, an autogenous arteriovenous fistula (AVF) is considered the best choice because it has better long-term patency, a lower risk of infection, fewer complications, and requires fewer interventions than prosthetic grafts or central venous catheters [1,2]. Although AVF is the preferred vascular access, failure of early maturation remains a common problem. Studies have reported that nearly 20–50% of newly created

fistulas fail to mature adequately for regular haemodialysis [3,4]. Early failure usually occurs within the first few weeks after surgery and may result from thrombosis, poor venous dilatation, intimal hyperplasia, inadequate arterial inflow, or technical factors during surgery [5]. Failure of AVF maturation often leads to prolonged use of central venous catheters, repeated surgical procedures, increased treatment costs, and poor patient outcomes.

Normal AVF maturation depends on gradual enlargement and remodelling of the vein after exposure to increased arterial blood flow. Adequate venous dilatation and increased blood flow are necessary to allow successful cannulation for haemodialysis. Following AVF creation, vascular injury activates platelets and inflammatory pathways, which can promote thrombus formation and neointimal hyperplasia, reducing the chances of successful fistula maturation [6].

Aspirin is a commonly used antiplatelet drug that irreversibly inhibits cyclooxygenase-1 (COX-1), thereby reducing thromboxane A_2 production and platelet aggregation. By decreasing platelet activation, aspirin may reduce early thrombosis and improve blood flow through the newly created fistula. Because it is inexpensive, widely available, and easy to administer, aspirin has been suggested as a possible method to improve early AVF maturation [7].

However, the role of aspirin after AVF creation is still debated. While some studies have reported improved fistula patency and reduced thrombosis with postoperative aspirin, other studies have shown little or no improvement in long-term AVF maturation [8–11]. Therefore, current international guidelines do not recommend the routine use of aspirin solely to improve AVF maturation because the available evidence remains inconclusive [12].

There is limited published information from eastern India, especially Bihar, regarding the use of aspirin after AVF creation. Differences in patient characteristics, prevalence of diabetes and hypertension, nutritional status, and healthcare facilities may influence AVF outcomes in this region. Therefore, generating local evidence is important for improving postoperative management. The present prospective comparative study was conducted to evaluate the effect of postoperative low-dose aspirin on early maturation and thrombosis of autogenous arteriovenous fistulas in patients undergoing haemodialysis at a tertiary care teaching hospital in Bihar.

Materials and Methods

Study Design and Setting: This prospective comparative observational study was conducted in the Department of Plastic and Reconstructive Surgery at PMCH, Patna, Bihar, India, over a period of 12 months (July 2025 to June 2026). Written informed consent was obtained from all participants before enrolment.

Study Population: Adult patients with end-stage renal disease (ESRD) scheduled for primary autogenous arteriovenous fistula (AVF) creation for maintenance haemodialysis were screened for eligibility.

Sample Size: A total of 40 patients were included in the study. Patients were allocated into two equal groups:

- **Group A (Aspirin group):** 20 patients received oral aspirin 75 mg once daily beginning on the first postoperative day and continued for six weeks.
- **Group B (Control group):** 20 patients received standard postoperative care without aspirin.

Inclusion Criteria

- Age between 18 and 70 years.
- Diagnosed with end-stage renal disease requiring maintenance haemodialysis.
- Undergoing first-time autogenous radiocephalic or brachiocephalic AVF creation.
- Suitable arterial and venous anatomy on preoperative Doppler ultrasonography.
- Ability to provide informed consent.

Exclusion Criteria

- Previous AVF surgery in the same limb.
- Current use of antiplatelet or anticoagulant medications.
- Known hypersensitivity to aspirin.
- Active gastrointestinal bleeding or peptic ulcer disease.
- Platelet count below 100,000/mm^3.
- Coagulation disorders.
- Chronic liver disease.
- Pregnancy or lactation.
- Inability to complete six weeks of follow-up.

Preoperative Assessment: All patients underwent detailed clinical evaluation including demographic profile, body mass index, duration of chronic kidney disease, associated comorbidities, history of diabetes mellitus, hypertension, smoking status, and previous dialysis access.

Routine investigations included:

- Complete blood count
- Serum creatinine
- Blood urea
- Serum electrolytes
- Liver function tests
- Coagulation profile
- Viral markers

- Doppler ultrasonography of upper limb vessels

Preoperative vascular mapping was performed to assess arterial diameter, venous diameter, vessel patency, and suitability for AVF creation.

Surgical Technique: All procedures were performed by experienced plastic surgeons under regional or local anaesthesia using standard aseptic precautions.

Depending on vascular anatomy, either:

- Radiocephalic AVF at the wrist, or
- Brachiocephalic AVF at the elbow

Was created using an end-to-side anastomosis with continuous polypropylene (6-0 or 7-0) sutures. Immediately after completion of the anastomosis, the presence of palpable thrill and audible bruit was confirmed.

Postoperative Management : All patients received routine postoperative wound care and were advised regarding limb positioning and AVF exercises.

Patients in Group A received:

- Aspirin 75 mg orally once daily for six weeks.

Patients in Group B received no antiplatelet therapy. No additional anticoagulants were administered unless clinically indicated.

Follow-up

Patients were evaluated at:

- Postoperative Day 1
- 2 weeks
- 4 weeks
- 6 weeks

Clinical examination included:

- Presence of thrill
- Presence of bruit
- Wound healing
- Signs of infection
- Haematoma
- Limb oedema
- Bleeding complications

Doppler ultrasonography was performed at six weeks to assess:

- AVF blood flow (mL/min)
- Vein diameter (mm)
- Presence of thrombosis
- Anastomotic stenosis

Clinical Assessment of AVF Maturation: At six weeks after surgery, AVF maturation was assessed clinically by inspection, palpation, and auscultation.

Clinical examination included assessment of a visible and adequately dilated superficial vein, a straight segment suitable for cannulation, absence of oedema, wound infection, haematoma, or skin necrosis, and the presence of a continuous palpable thrill with a continuous low-pitched bruit.

The vein was also assessed for adequate compressibility and suitability for two-needle cannulation. Clinical findings were confirmed by colour Doppler ultrasonography, which measured vein diameter and blood flow to determine successful AVF maturation.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using SPSS version 26.0.

Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables as frequency and percentage. Comparisons between groups were performed using the independent Student's t-test for continuous variables and the

Chi-square test or Fisher's exact test for categorical variables. A p-value of <0.05 was considered statistically significant.

Results

A total of 40 patients with end-stage renal disease undergoing primary autogenous arteriovenous fistula (AVF) creation were included in the study. Twenty patients received postoperative low-dose aspirin (Group A), while twenty patients received standard postoperative care without aspirin (Group B). All patients completed the six-week follow-up, and there were no losses to follow-up.

Table 1: Baseline demographic characteristics

Variable	Aspirin Group (n=20)	Control Group (n=20)	p-value
Age (years), Mean ±SD	46.8 ±11.2	48.5 ±10.4	0.61
Male	13 (65%)	12 (60%)	0.74
Female	7 (35%)	8 (40%)	
BMI (kg/m²)	20.8 ±2.7	21.1 ± 2.9	0.74
Diabetes mellitus	9 (45%)	10 (50%)	0.75
Hypertension	16 (80%)	17 (85%)	0.68
Duration of CKD (months)	22.3 ±7.6	21.5 ±8.1	0.78

There were no statistically significant differences in baseline demographic or clinical characteristics between the two groups, indicating good comparability.

Table 2: Type of AVF created

Type of AVF	Aspirin (n=20)	Control (n=20)	p-value
Radiocephalic	14 (70%)	15 (75%)	0.72
Brachiocephalic	6 (30%)	5 (25%)	

Radiocephalic fistula was the most commonly performed procedure in both groups.

Table 3: Clinical Assessment of AVF Maturation at Six Weeks

Clinical assessment parameter	Aspirin (n = 20)	Control (n = 20)	p-value
Visible, dilated superficial vein	18 (90%)	14 (70%)	0.11
Continuous palpable thrill	19 (95%)	16 (80%)	0.15
Continuous low-pitched bruit	19 (95%)	16 (80%)	0.15
Suitable for two-needle cannulation	18 (90%)	14 (70%)	0.11
Successful clinical AVF maturation	**18 (90%)**	**14 (70%)**	**0.11**

Values are presented as n (%). Clinical maturation was assessed by inspection, palpation, and auscultation. Colour Doppler ultrasonography was performed to confirm the clinical findings by measuring vein diameter and blood flow.

Table 4: Primary outcome (AVF maturation at 6 weeks)

Outcome	Aspirin (n=20)	Control (n=20)	p-value
Matured AVF	18 (90%)	14 (70%)	**0.048**
Failed maturation	2 (10%)	6 (30%)	

Patients receiving aspirin demonstrated a significantly higher rate of successful AVF maturation compared with the control group (90% vs. 70%; p=0.048).

Clinical examination at six weeks demonstrated a higher rate of successful AVF maturation in the aspirin group than in the control group (90% vs. 70%). Patients receiving aspirin more frequently had a well-dilated vein with a continuous thrill and bruit, making the fistula suitable for two-needle cannulation. These clinical findings were consistent with the colour Doppler examination, which showed greater blood flow and larger vein diameter in the aspirin group.

Table 5: Doppler ultrasound findings at 6 weeks

Parameter	Aspirin	Control	p-value
Blood flow (mL/min)	712 ±118	624 ±109	**0.031**
Vein diameter (mm)	6.6 ±0.8	5.9 ±0.9	**0.022**
Vein depth (mm)	4.4 ±0.7	4.6 ±0.8	0.41

The aspirin group achieved significantly higher blood flow and larger vein diameter at six weeks. Both groups had similar vein depth measurements. AVF maturation was assessed using the commonly accepted sonographic "Rule of 6s" criteria.

Table 6: Early postoperative complications

Complication	Aspirin (n=20)	Control (n=20)	p-value
Early thrombosis	1 (5%)	4 (20%)	0.15
Wound infection	1 (5%)	2 (10%)	0.54
Hematoma	1 (5%)	1 (5%)	1.00
Re-exploration	0	1 (5%)	0.31
Major bleeding	0	0	—

Although early thrombosis occurred less frequently in the aspirin group, the difference did not reach statistical significance because of the small sample size. No patient experienced major postoperative bleeding attributable to aspirin therapy.

Table 7: Functional outcomes

Variable	Aspirin	Control	p-value
Suitable for first dialysis at 6 weeks	18 (90%)	14 (70%)	**0.048**
Required secondary intervention	1 (5%)	4 (20%)	0.15

A higher proportion of patients in the aspirin group achieved functional AVF use at six weeks. Fewer patients required secondary intervention, although this difference was not statistically significant.

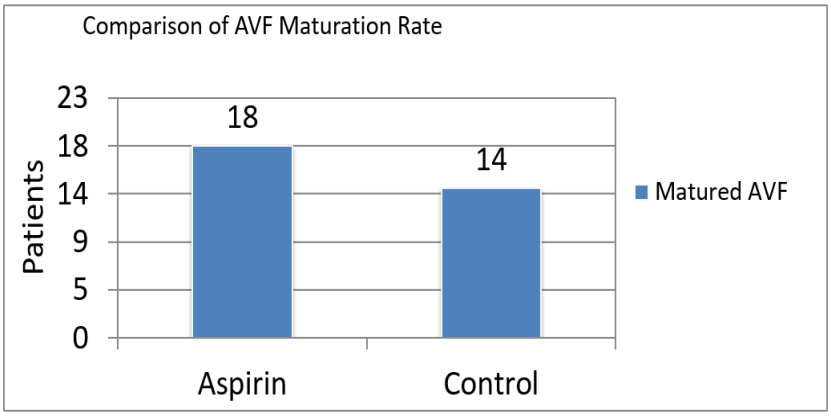

Figure 1: Comparison of successful arteriovenous fistula maturation between the study groups

Bar diagram showing the number of patients with successful arteriovenous fistula (AVF) maturation at six weeks after surgery. The aspirin group demonstrated a higher maturation rate (18/20, 90%) compared with the control group (14/20, 70%).

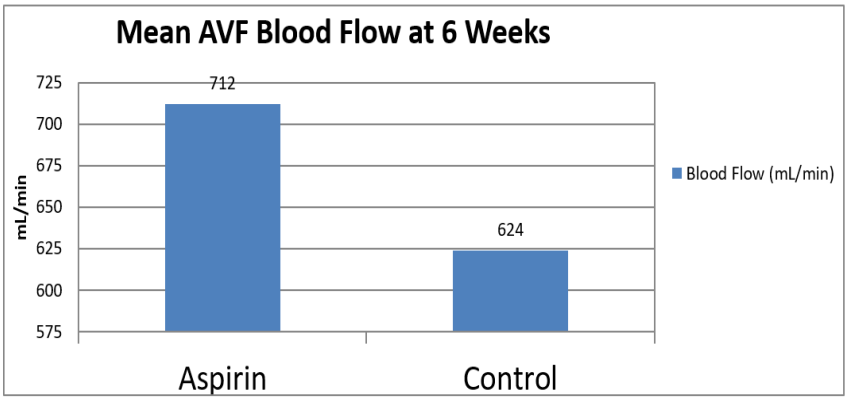

Figure 2: Comparison of mean arteriovenous fistula blood flow at six weeks

Bar diagram comparing the mean AVF blood flow measured by Doppler ultrasonography at six weeks after surgery. Patients receiving postoperative aspirin had a higher mean blood flow (712 mL/min) than patients in the control group (624 mL/min), indicating better haemodynamic maturation.

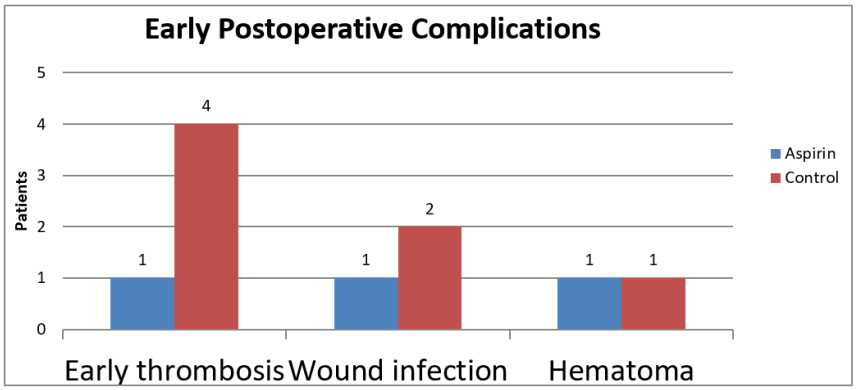

Figure 3: Comparison of early postoperative complications between the study groups

Clustered bar diagram showing the incidence of early postoperative complications following AVF creation. The aspirin group had fewer cases of early thrombosis (1 vs. 4 patients), while wound infection and hematoma rates were similar in both groups. No major bleeding events were observed during the study period.

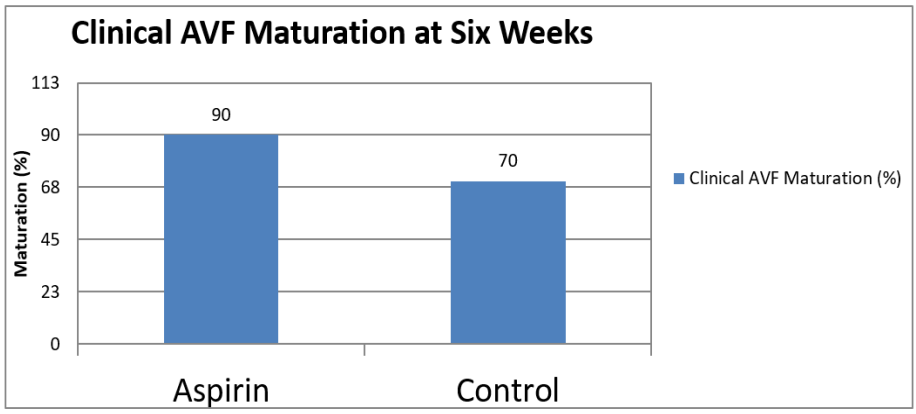

Figure 4: Clinical Assessment of Arteriovenous Fistula Maturation at Six Weeks

Clinical examination demonstrated a higher rate of successful AVF maturation in the aspirin group (90%) compared with the control group (70%). These findings were confirmed by colour Doppler ultrasonography.

Discussion

Autogenous arteriovenous fistula (AVF) is the preferred vascular access for long-term haemodialysis because it has better patency and fewer complications than prosthetic grafts or central venous catheters. However, early AVF failure due to thrombosis and delayed maturation remains a common clinical problem, with reported failure rates ranging from 20% to 50% [1–5]. Therefore, identifying simple methods to improve early AVF maturation is important.

In the present study, patients who received postoperative low-dose aspirin (75 mg once daily for six weeks) showed a higher AVF maturation rate (90% vs. 70%) than the control group. Clinical assessment and colour Doppler findings showed good agreement in our study, indicating that patients receiving aspirin achieved better functional maturation as well as improved haemodynamic parameters during the early postoperative period. The aspirin group also had higher Doppler blood flow, larger vein diameter, fewer thrombotic events, and no significant increase in major bleeding. These findings suggest that aspirin may improve early fistula maturation by reducing platelet-mediated thrombosis during the early postoperative period.

Both study groups were comparable with regard to age, sex, diabetes, hypertension, body mass index, and duration of chronic kidney disease. This indicates that the differences observed in AVF outcomes were more likely related to the postoperative use of aspirin rather than differences in baseline patient characteristics. Aspirin reduces platelet aggregation by inhibiting cyclooxygenase-1 (COX-1) and decreasing thromboxane A_2 production. This antiplatelet effect may help maintain early fistula patency, improve blood flow, and support venous remodelling after AVF creation [6,7].

Our findings are comparable with those of several previous studies that reported improved early AVF patency and reduced thrombosis with antiplatelet therapy [8–11]. A recent systematic review also found that aspirin improved AVF blood flow and early maturation in many studies, although the evidence for long-term benefit remained inconsistent [11]. Similarly, we observed better Doppler blood flow and a higher maturation rate in patients receiving aspirin.

Early thrombosis occurred less frequently in the aspirin group (5%) than in the control group (20%). Although this difference was not statistically significant because of the small sample size, it is clinically important. Previous randomized studies and meta-analyses have also shown that antiplatelet therapy reduces early thrombotic occlusion after AVF creation but may not consistently improve long-term functional maturation [10–12]. No major bleeding complications were observed in the aspirin group during the study period. Only one patient developed a minor haematoma, which was managed conservatively. These findings are consistent with previous studies reporting that low-dose aspirin is generally safe and is not associated with a significant increase in major bleeding after AVF creation [10–12]. Another important finding of our study was that a greater proportion of patients in the aspirin group had a mature fistula suitable for haemodialysis at six weeks. Early functional maturation may reduce dependence on central venous catheters, decrease catheter-related complications, and improve the overall quality of haemodialysis care. The findings of this study are particularly relevant for eastern India, where limited data are available regarding postoperative aspirin use after AVF creation. Because aspirin is inexpensive, easily available, and widely used, it may be a practical option to improve early AVF outcomes in carefully selected patients.

The present study has some limitations, including the small sample size, single-centre design, and short follow-up period. Therefore, long-term AVF patency could not be assessed. Larger multicentre randomized studies with longer follow-up are required to confirm these findings.

Overall, the results of this study suggest that postoperative low-dose aspirin may improve early AVF maturation and reduce early thrombosis without increasing major bleeding complications. However, further large-scale studies are needed before routine postoperative aspirin can be recommended for all patients undergoing AVF creation.

Conclusion

The findings of this study suggest that postoperative low-dose aspirin may improve early maturation of autogenous arteriovenous fistulas by reducing thrombosis and increasing blood flow, without causing significant bleeding complications. As aspirin is inexpensive and easily available, it may be a useful postoperative treatment in selected patients undergoing AVF creation. However, because of the small sample size and short follow-up, larger randomized studies are needed to confirm its effectiveness and safety.

Study Limitations

This study has a few limitations. The sample size was small, with only 40 patients, which may have affected the statistical significance of some outcomes. The study was conducted at a single tertiary care centre, so the findings may not be applicable to all patient populations. The follow-up period was limited to six weeks, and therefore long-term AVF patency and dialysis outcomes could not be assessed. Only low-dose aspirin (75 mg/day) was evaluated, while other antiplatelet drugs were not studied. Further multicentre studies with a larger sample size and longer follow-up are needed to confirm these findings.

Future Recommendations: Future research should focus on:

- Large multicentre randomized controlled trials.
- Longer follow-up (12–24 months) to assess primary and secondary patency.
- Comparison of aspirin with other antiplatelet agents such as clopidogrel.
- Evaluation of combined pharmacological and exercise-based interventions.
- Identification of patient subgroups most likely to benefit from antiplatelet therapy.
- Cost-effectiveness analyses in low-resource healthcare settings.

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