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Original Research Article

Comparison of Dual Antiplatelet Therapy Versus Triple Anti-Thrombotic Therapy in Patients Undergoing Percutaneous Coronary Intervention Having a Heavy Thrombus Burden

Article History:

Name of Author:
Fahim Ahmad Danish[1], Ahmad Noeman[2], Habib Sultan[3], Samar Arfeen[4], Syed Jalal ud Din[5], Gul Shan Ahmad[6]

Affiliation:
[1]*PGR FCPS Cardiology, Punjab Institute of Cardiology,*
[2]*Professor of Cardiology, Punjab Institute of Cardiology*
[3]*PGR FCPS Cardiology, Punjab Institute of Cardiology*
[4]*Senior Registrar Cardiology, Punjab Institute of Cardiology, Lahore*
[5]*PGR FCPS Cardiology, Punjab Institute of Cardiology*
[6]*Senior Registrar Cardiology, Punjab Institute of Cardiology*

Corresponding Author:
Fahim Ahmad Danish
Danishfahimahmad@gmail.com

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Abstract:
Objective: To contrast the safety and efficacy of dual antiplatelet therapy with triple antithrombotic therapy in PCI patients with a heavy thrombus burden.
Study Design: Comparative study.
Place and Duration of Study: Department of Cardiology, Punjab Institute of Cardiology, Lahore, from 01/08/2025 till 31/10/2025.
Methodology: A total of 270 patients aged 20–80 years undergoing PCI for acute coronary syndrome with thrombus burden grade III or higher and TIMI flow <3 were included. Patients were randomly assigned to two groups: Group A received dual antiplatelet therapy, while Group B received triple antithrombotic therapy for 1 month.
Results: Recurrent myocardial infarction occurred in 18 (13.3%) patients in the dual therapy group and 5 (3.7%) patients in the triple therapy group (p=0.0089). After adjustment, triple therapy significantly reduced the odds of recurrent MI (Adjusted OR 0.25, 95% CI 0.09–0.70, p=0.008). Bleeding events were slightly higher in the triple therapy group (11.1% vs 8.1%), but the difference was not statistically significant (p=0.536). Stent thrombosis rates were comparable (5.9% vs 5.2%, p=1.000), and mortality was low in both groups (3.0% vs 1.5%, p=0.680).
Conclusion: Triple antithrombotic therapy significantly reduced recurrent myocardial infarction in patients with heavy thrombus burden undergoing PCI, without a significant increase in bleeding or mortality.

Keywords: Percutaneous coronary intervention, Dual antiplatelet therapy, Triple antithrombotic therapy, Bleeding.

INTRODUCTION

In patients with an indication of anticoagulation, there is a controversy on whether or not dual therapy with two antiplatelet agents could be administered following percutaneous coronary intervention (PCI) or acute coronary syndrome rather than triple therapy of an oral anticoagulant and dual antiplatelet therapy [1]. Antiplatelet therapy cannot be discussed without bleeding because it is of pharmacological use in the prevention of local thrombotic complications and the general incidence of ischemia in PCI patients. It has been the continuous improvement of the stent technologies combined with the high rate of ischemic

recurrence following the PCI procedure and the insight of prognostic connotations with bleeding, the reason behind a significant change in the antiplatelet regimens over the last decades [2,3].

Dual antiplatelet therapy of aspirin and clopidogrel is the solution to the prevention of stent thrombosis after PCI. Atrial fibrillation depends on the use of oral anticoagulant drugs to minimize incidences of thromboembolism like stroke [4]. Numerous researches have been conducted to optimize patients undergoing PCI even further upon both ischemic and bleeding risks and provide antithrombotic vigilance to such individuals. The results of such studies have resulted in a number of antithrombotic therapy agents as per the current guidelines [5,6]. Lee et al., also reported that there is no difference in the outcome of using the dual antiplatelet therapy versus triple anti-thrombotic therapy in patients who have heavy burden of thrombus in terms of stent thrombosis (0.5% vs. 0.1%), Myocardial infarction (0.7% vs. 0.2%), bleeding (0.6 vs.0.8). But Yan et al., reported that recurrent myocardial infarction i.e., 14.52% with dual therapy and 5.34% with triple therapy, while bleeding was 1.61% with dual therapy and 7.59% with triple therapy, and death in 9.68% vs. 8.10% ($p>0.05$) [8]. Agarwal conducted a meta-analysis and observed that major bleeding was lower in dual therapy cohort compared to triple therapy. No difference was observed between the two groups for myocardial infarction, and stent thrombosis [9].

Objective

To compare the outcome of dual antiplatelet therapy versus triple anti-thrombotic therapy in patients undergoing percutaneous coronary intervention having a heavy thrombus burden

METHODOLOGY:

This Comparative Study was conducted at Department of Cardiology, Punjab Institute of Cardiology, Lahore from 01/08/2025 till 31/10/2025. By using WHO calculator, sample size of 270 cases; 135 in each group is calculated with 80% power of study, 5% significance level and percentage of recurrent myocardial infarction i.e. 14.52% with dual therapy and 5.34% with triple therapy [8]. Non-probability, consecutive sampling technique was used to collect the data. The patients who participated in the study were aged 20-80 years and of either gender and they underwent PCI due to acute coronary syndrome (ACS) with thrombus burden grade III and above and TIMI flow less than 3 (according to the operational definition). Patients were also disqualified in case they had a prior history of a PCI, coronary artery bypass graft (CABG) surgery, saphenous vein graft (SVG) intervention, history of cerebrovascular accident (ischemic or hemorrhagic), contraindication to antiplatelet agents, severe left ventricular dysfunction (ejection fraction [<]30%), left main coronary artery stenosis, thrombocytopenia (<150x109/L), gastrointestinal bleeding. Upon receiving the approval of the ethical review committee, 270 eligible patients who are admitted to the angiography wards were recruited. Informed consent was taken in writing among all the participants. Age, gender, duration of ACS, TIMI score, residence, occupation, lifestyle factors, smoking history (over 5 pack years), alcohol consumption (over 20 ml/day), hypertension (BP >140/90 mmHg), dyslipidemia (total cholesterol over 200 mg/dL), family history of ACS, type of ACS (unstable angina, STEMI, NSTEMI) were registered as baseline demographic and clinical data. All the patients were treated in line with the routine institutional procedures and were subjected to the PCI conducted by a minimum of three or more interventional cardiologists all having at least 3 years of experience and were placed under local anesthesia. The lottery was the method of assigning the patients to two groups randomly. Group A was given a combination of aspirin (80-300 mg) and clopidogrel (75 mg) during one month as a dual antiplatelet therapy. Group B was treated with triple antithrombotic therapy which comprised of aspirin (75 mg), clopidogrel (75mg) and oral anticoagulant (Apixaban 2.5mg once daily) over a period of one month. The two groups continued dual antiplatelet therapy at the same dose after 1 month. The outpatient department followed all patients within a period of one month to evaluate stent thrombosis, recurrent myocardial infarction, bleeding and mortality based on predefined operational definitions. The researcher noted data on specially designed pro forma. The SPSS version 27.0 was used to achieve statistical analysis. The Shapiro-Wilk test was used to determine whether the quantitative variables were normal. Continuous variables like age and duration of ACS were provided in the form of the mean +- standard deviation. The results of the two groups were compared using the chi-square test. A p-value<0.05 was regarded as significant.

RESULTS

Data were collected from 270 patients; mean age was 50.30 ± 16.89 years in the DAPT group and 47.68 ± 16.80 years in the triple therapy group. Male patients constituted 51.9% in the DAPT group and 50.4% in the Group B. Smoking history was present in 35.6% versus 33.3%, while alcohol consumption was reported in 21.5% versus 19.3%, respectively. Hypertension was observed in 50.4% of patients in the DAPT group and 53.3% in the triple therapy group. Dyslipidemia was present in 43.7% versus 46.7%, and family history of ACS in 28.9% versus 31.1%. The distribution of ACS types was similar, with STEMI in 45.9% versus 48.1%, NSTEMI in 36.3% versus 34.1%, and unstable angina in 17.8% in both groups, indicating well-balanced baseline characteristics (Table 1).

Table 1. Baseline Demographic and Clinical Characteristics

Variable	DAPT (n=135)	Triple Therapy (n=135)
Age (years), Mean ± SD	50.30 ± 16.89	47.68 ± 16.80
Male	70 (51.9%)	68 (50.4%)
Female	65 (48.1%)	67 (49.6%)
Smoking (>5 pack years)	48 (35.6%)	45 (33.3%)
Alcohol (>20 ml/day)	29 (21.5%)	26 (19.3%)
Hypertension	68 (50.4%)	72 (53.3%)
Dyslipidemia	59 (43.7%)	63 (46.7%)
Family History of ACS	39 (28.9%)	42 (31.1%)
STEMI	62 (45.9%)	65 (48.1%)
NSTEMI	49 (36.3%)	46 (34.1%)
Unstable Angina	24 (17.8%)	24 (17.8%)

Thrombus grade III was observed in 41.5% of patients in the DAPT group and 44.4% in the triple therapy group (p=0.73). Thrombus grade IV occurred in 34.8% versus 32.6%, while grade V was seen in 23.7% versus 23.0%, respectively. All patients in both groups had TIMI flow <3 prior to PCI (Table 2).

Table 2. Procedural Characteristics

Variable	DAPT (n=135)	Triple Therapy (n=135)	p-value
Thrombus Grade III	56 (41.5%)	60 (44.4%)	0.73
Thrombus Grade IV	47 (34.8%)	44 (32.6%)	
Thrombus Grade V	32 (23.7%)	31 (23.0%)	
TIMI Flow <3 (Pre-PCI)	135 (100%)	135 (100%)	—

At one-month follow-up, recurrent myocardial infarction occurred significantly more frequently in the DAPT group compared to the triple therapy group (13.3% vs 3.7%, p=0.0089). Stent thrombosis rates were comparable (5.2% vs 5.9%, p=1.000). Bleeding events were slightly higher in the triple therapy group (11.1% vs 8.1%), though not statistically significant (p=0.536). Mortality was low in both groups (1.5% vs 3.0%, p=0.680). The composite endpoint occurred in 17.0% of the DAPT group and 9.6% of the triple therapy group (p=0.067), demonstrating a favorable trend toward triple therapy (Table 3).

Table 3. Primary Outcome – Recurrent Myocardial Infarction (1 Month)

Outcome	DAPT (n=135)	Triple Therapy (n=135)	p-value
	18 (13.3%)	5 (3.7%)	**0.0089**
Recurrent MI – No	117 (86.7%)	130 (96.3%)	
Stent Thrombosis – Yes	7 (5.2%)	8 (5.9%)	1.000
Bleeding – Yes	11 (8.1%)	15 (11.1%)	0.536
Mortality – Yes	2 (1.5%)	4 (3.0%)	0.680
Composite Event – Yes	23 (17.0%)	13 (9.6%)	0.067
Composite Event – No	112 (83.0%)	122 (90.4%)	
No Bleeding	124 (91.9%)	120 (88.9%)	0.536
Minor Bleeding	9 (6.7%)	11 (8.1%)	
Major Bleeding	2 (1.5%)	4 (3.0%)	

Multivariate logistic regression analysis demonstrated that triple therapy was independently associated with a significant reduction in recurrent myocardial infarction (Adjusted OR 0.25, 95% CI 0.09–0.70, p=0.008). Age (OR 1.00, 95% CI 0.97–1.03, p=0.954), hypertension (OR 0.59, 95% CI 0.25–1.43, p=0.245), and smoking (OR 0.63, 95% CI 0.22–1.79, p=0.385) were not statistically significant predictors of recurrent MI after adjustment (Table 4).

Table 4. Multivariate Logistic Regression Analysis for Recurrent MI

Variable	Adjusted OR	95% CI	p-value
Triple Therapy (vs DAPT)	**0.25**	0.09 – 0.70	**0.008**
Age (per year increase)	1.00	0.97 – 1.03	0.954
Hypertension	0.59	0.25 – 1.43	0.245
Smoking	0.63	0.22 – 1.79	0.385

DISCUSSION

This comparative study was a way of evaluating the efficacy and safety of dual antiplatelet therapy (DAPT) compared to triple antithrombotic therapy in patients undergoing PCI with heavy thrombus burden. The main result of the study was that triple therapy was more effective than dual therapy at reducing recurrent myocardial infarction (3.7% vs 13.3%, p=0.0089). This

advantage was further proved by multivariate logistic regression that showed that triple therapy reduced adjusted odds of recurrent MI by 75%. The new evidence indicates that the increased use of antithrombotic therapy can be truly beneficial in terms of preventing early thrombotic complications among high-thrombus burden patients. It has been established that heavy burden of thrombus predisposes to distal embolization, impaired microvascular perfusion, and early ischemic reoccurrence after PCI [10-12]. Platelet inhibition might not be enough in high-risk anatomical locations, where thrombin-induced fibrin deposition goes on to propagate thrombus. Triple therapy probably benefits from the addition of an oral anticoagulant that improves the thrombin inhibition and thus minimizes the chances of recurrent ischemic incidents. The high rate of recurrent MI reduction that we observed in our study provides biological plausibility of the targeting of both platelet activation and coagulation pathways in this subgroup [13,14].

Even though ischemic outcomes were improved, the triple therapy was numerically related to a higher rate of bleeding (11.1% vs 8.1%), but it was not statistically significant (p=0.536). This observation conforms to the established trade-off between ischemic pretentiousness and bleeding danger in strengthened antithrombotic regimes. Notably, the presence of major bleeding incidents was minimal in general, and both the mortality rates did not differ significantly (3.0% vs 1.5, p=0.680), implying that short-term triple therapy might be a relatively safe intervention when used in a well-selected patient with a low risk of bleeding. Interestingly there was no difference in the rate of stent thrombosis between groups (5.9 vs 5.2, p=1.000), this shows that the main outcome of triple therapy in this study group was the minimization of a recurring MI but not prevention of definite stent thrombosis [15-17]. This can be an indicator of multifactorial processes that play a role in recurrent ischemia even with the exclusion of stent processes. The composite outcome analysis showed a good result with a trend in favor of triple therapy (9.6% vs 17.0%), with a statistically significant border. This implies that triple therapy provides a significant ischemic advantage but overall net clinical advantage should be viewed through the lenses of bleeding risk and patient selection [18,19].

Limitations

This paper has a number of limitations. To begin with, it was carried out in one tertiary care center only, which could be a constraining factor regarding the extrapolation of the results to more extensive populations. Second, the study was not blinded, thus it is possible that treatment or observer bias may have been involved because patients were being randomly assigned to the study. Third, the follow-ups were restricted to a month, which did not allow evaluation of ischemic and bleeding outcomes in the long term. Fourth, the sample size, though sufficient to push the recurrent myocardial infarction, might not have been enough to study the difference in events with a lower frequency, such as mortality and major bleeding. Also, the severity of bleeding was not stratified to standardized classifications but only basic categorization was employed, and the unmeasured confounders might have had an effect even after multivariate adjustment.

CONCLUSION:

It is concluded that in patients undergoing PCI with heavy thrombus burden, short-term triple antithrombotic therapy significantly reduced the incidence of recurrent myocardial infarction compared to dual antiplatelet therapy, without a statistically significant increase in bleeding or mortality. While bleeding events were numerically higher in the triple therapy group, overall safety outcomes remained acceptable.

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