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The use of ticagrelor with clopidogrel in patients after interventional therapy for acutely coronary syndrome and effect on serum specificity indices

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Abstract: Acute coronary syndrome (ACS) is a severe form of coronary artery disease that poses a major challenge to clinical management. This study evaluated the effects of ticagrelor and clopidogrel on serum biomarkers and clinical outcomes after intervention in patients with ACS. 112 ACS patients (June 2023 to June 2024) were enrolled and randomized into two groups: control group (n=56) and study group (n=56). Both groups received clopidogrel treatment, while the study group was additionally treated with ticagrelor. Platelet aggregation rate, serum inflammatory markers, cardiac function indices (LVEF, LVEDD, LVESD), immune function, microcirculatory function (CFR, IMR), clinical efficacy, and adverse events were assessed at various time points. Postoperative indicators improved in both groups (P<0.05). Platelet aggregation rate, inflammatory index level, LVEDD and LVESD, percentage of CD8+ T cellls, IMR level and incidence of adverse reactions were lower in Study group patients than in Control group (P<0.05). Study group patients had higher LVEF, percentage of CD3+ T cellls, CD4+ T cellls, CFR level and clinical efficacy than Control group (P<0.05). The efficacy of ticagrelor and clopidogrel in the post-interventional period in patients with ACS is definite and of high clinical value.

Keywords: Ticagrelor; clopidogrel; acute coronary syndrome; inflammatory factors; serum specificity indices

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INTRODUCTION

Acute coronary syndrome (ACS) is a serious type of coronary heart disease, in which rupture of atherosclerotic plaques in coronary arteries leads to acute myocardial ischemia, thrombosis, gradual narrowing of blood vessels, and sudden complete occlusion of coronary arteries, resulting in a series of clinical syndromes. Myocardial ischemia will lead to myocardial tissue damage or even necrosis, resulting in structural changes of the heart, often manifested as angina pectoris or myocardial infarction, mostly in the middle-aged and elderly population. It is easy to recur after treatment and is characterised by high disability and death rates (Bergmark *et al.*, 2022; Bhatt *et al.*, 2022). Atherosclerotic plaque rupture is currently considered the main factor leading to ACS, mostly caused by acute coronary artery occlusion, at which time patients require urgent coronary revascularisation and percutaneous correctional interventions (PCI) is the main treatment for ACS (Maria *et al.*, 2022). PCI is a therapeutic approach to improve myocardial blood flow by unblocking the lumen of a patient's coronary arteries with a cardiac stent or catheter, which can quickly unblock blocked coronary arteries and restore myocardial perfusion, thus saving dying myocardial function (Ozaki *et al.*, 2024).

PCI can effectively improve patients' quality of life, however, some patients may experience recurrence of hypercoagulation and inflammation after PCI and it is difficult to reverse or slow down the development of atherosclerosis, resulting in a high risk of postoperative cardiovascular events (Zhuo *et al.*, 2022). During treatment, patients are prone to dislodgement of tiny thrombi, causing embolism at the distal end of the vessel, affecting the normal blood supply and leading to complications very easily. At the same time, their postoperative period is often accompanied by local inflammatory reactions and the risk of elevated cardiac enzymes. Therefore, postoperative treatment with antiplatelet aggregation and other drugs is needed to prevent thrombus formation in the stent and improve the prognosis of intervention (Nakamura *et al.*, 2022).

Currently, clopidogrel and ticagrelor are mostly used in the clinical treatment of ACS to ameliorate atherosclerosis, inhibit platelet aggregation, and prevent the formation of microthrombi in blood vessels (Zhen and Zhang, 2024). Ticagrelor can act directly on $P2Y_{12}$ receptor, without activation by liver-related metabolic enzymes, and can rapidly inhibit platelet activation. At the same time, it can inhibit the inflammatory response, remove necrotic cardiomyocytes, improve coronary artery blood flow, and help restore myocardial perfusion. Ticagrelor can effectively restore coronary blood flow, reduce myocardial injury and protect cardiac function (Wei *et al.*, 2024). Akkaif *et al.* reported from clinical trials that ticagrelor significantly and dose-dependently increased blood concentrations and myocardial protection by adenosine, while preventing platelet aggregation and

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prolonging the biological effects of coronary arteries (Akkaif *et al.*, 2021). Clopidogrel is a $P2Y_{12}$ receptor inhibitor, which can binds to the adenosine diphosphate receptors on the platelet membranes surfaces. Clopidogrel can bind to the adenosine diphosphate (ADP) receptor on the surface of platelet membrane, which can prevent fibrinogen from binding to the ADP-mediated placental glycoprotein IIb/IIIa receptors and reciprocally inhibits platelet aggregate, and block the activation and aggregation of platelets caused by ADP to reduce thrombosis. It can also inhibit platelet activation and aggregation caused by ADP, reducing thrombosis. It can also inhibit the production of inflammatory factors and reduce vascular endothelial damage, but it does not have an antiplatelet effect, and needs to be catalysed by cytochrome P450 isoforms to produce activity, and is affected by gene polymorphisms, resulting in some patients with high resistance to drugs (Kuszynski and Lauver, 2022; L Wang *et al.*, 2021). However, the action between ticagrelor and $P2Y_{12}$ receptor is reversible, and as a non-precursor drug, ticagrelor can exert its effect directly after entering the patient's body, and does not need to be metabolised by the liver. Therefore, the effect of the drug can be exerted more rapidly than clopidogrel, which can effectively improve the cardiac microcirculation of patients, and prevent coronary artery thrombosis, which can effectively reduce the risk of cardiovascular adverse events (Chyrchel *et al.*, 2019; Y Wang *et al.*, 2019).

Some studies have reported that at present the most commonly used modality for PCI is clopidogrel or tiglitazarol alone, and there are also studies combining the two for the treatment of coronary artery disease. However, these drugs are not widely used in many primary hospitals due to the price of the drugs and clinical experience with the drugs. Its effect on patients' serum-specific indexes and immune function has not been fully clarified, while various complications after PCI have also brought great challenges to the treatment of ACS patients. Meanwhile, various post-PCI complications bring great challenges to the treatment of ACS patients. In this context, the present study was conducted to compare and analyse the therapeutic effects of the combination of ticagrelor and clopidogrel in post-PCI and the serum-specific indexes of old analysis, with a view to providing new reference therapies for clinical treatment.

MATERIALS AND METHODS

Patient selection criteria

Inclusion criteria

(1) Meet the relevant diagnostic criteria for ACS and undergo PCI; (2) Patients meet the indications for PCI; (3) Patients have their first episode of disease and have not previously received PCI, including outpatients and inpatients; (4) Patients are available for post-procedure review and follow-up with completed clinical profiles; (5) Patients and their family members have signed an informed consent agreement and the subject research was vetted and endorsed from the hospital's Ethics Committees (2025-11).

Exclusion criteria

(1) Patients with combined malignant tumours and severe organ insufficiency; (2) Patients with infectious diseases; (3) Patients with a history of allergy or contraindications to the drugs used in this study, such as peptic ulcer; (4) Patients with coagulation disorders; and (5) Patients who have undergone surgical procedures in the last month, or who have active bleeding or shock.

General information

A total of 112 ACS patients with coronary interventional therapy in June 2023 to June 2024 were categorised into two groups of 56 cases each according to the different treatment plans. Control group: 29 men, 27 women, age 51-70 years old, mean age 60.28±4.16 years old, duration of the disease 1-6 years, mean 2.98±1.51 years. Study group: 26 males, 30 females, age 51-70 years old, average age 59.99±3.15 years, disease duration 1-6 years, average 3.05±1.51 years.

Study design

This study is a systematic clinical retrospective study aimed at analysing the clinical efficacy of the combination of ticagrelor and clopidogrel in the treatment of postoperative ACS patients, and further evaluating its effect on the patients' serum specificity indexes. One hundred and twelve ACS patients admitted from Lishui People' s Hospital from June 2023 to June 2024 were selected and randomly divided into Control group (n=56) and Study group (n=56). Both groups were treated with clopidogrel, and patients in the Study group were treated with the addition of ticagrelor.

Treatment

Patients in both groups were treated with electrolyte correction, antibacterial and anti-inflammatory treatment, and emergency treatment. Control group patients were treated with clopidogrel, orally, 2 tablets/dose, once daily for 12 months. Study group patients were additionally treated with ticagrelor on the basis of Control group, orally, 1 tablet/dose, twice a day, for 12 months. Clopidogrel bisulfate tablets, Shenzhen Xinlitai Pharmaceutical Co., Ltd, National Drug Code H20120035, specification 75mg/tablet. Ticagrelor tablets, Shanghai Shangzhu Kangdele Pharmaceutical Co., Ltd, State Drug Permit H20120486, specification 90mg/tablet.

Efficacy evaluation indexes

Platelet aggregation rate (PAR)

According to the study method reported by Tsoupras et al. (Tsoupras *et al.*, 2019), PAR was examined in both groups of patients, and 3 mL of peripheral venous blood was

drawn from patients at 2h, 24h and 1 week postoperatively and PAR was examined by platelet aggregometer.

Comparison of inflammatory factor indicators

According to the research method of Aleman et al. and with simple modification (Aleman *et al.*, 2024), the inflammatory indexes of serum of the two groups of patients were detected by extracting patients' venous blood, centrifuging at 3500 r/min, diameter of 10 cm for 10 min, taking the supernatant after serum separation, and then testing the serum specimens uniformly by our hospital's laboratory using the ELISA method to record the level of patients' postoperative serum inflammatory factors, respectively. The levels of serum inflammatory factor interleukin-6 (IL-6), Soluble Cluster of differentiation 40 ligand (sCD40L), tumor necrosis factor-α (TNF-α) and high sensitivity C-Reactive Protein (hs-CRP) were recorded respectively.

The kits used were human IL-6 ELISA Kit (PI330, Beyotime Biotechnology), human sCD40L ELISA Kit (kt98074, Wuhan Mersak Biotechnology Co., Ltd.), human TNF-α ELISA Kit (97072ES96, Shanghai Yeasen Biotechnology Co., Ltd.) and human hs-CRP ELISA Kit (kt98807, Wuhan Mersak Biotechnology Co., Ltd.).

Cardiac function

Left venturericular ejection fractions (LVEF), left venturericular end-ductile diameters (LVEDD), left venturericular end-systolic diameters (LVESD) were examined using echocardiography in the both groups of patients preoperatively and 1 week postoperatively, respectively (Chen *et al.*, 2022).

Indicators of immune function

Blood cell immunity indices were assessed by flow cytometry (Sahir *et al.*, 2024), and employed to analyse the proportions of the relative constituent T-lymphocyte subgroups CD3+ T-cells, CD4+ T-cells, and CD8+ T-cells in the venous blood of all the patients at 1 d preoperatively and 30 d postoperatively.

Indicators of microcirculatory function

Coronary fractional resistance (CFR) and indexs of microcirculatory resistance (IMR) were measured using GE Vivid E9 Doppler ultrasound before and after treatment in both groups of patients (Rafique *et al.*, 2023).

Efficacy evaluation criteria

The evaluation criteria of therapeutic efficacy were based on the Guidelines for the Diagnosis and Treatment of Stable Coronary Heart Disease (Maron David *et al.*, 2020). Apparent effect: patients' cardiac function is greatly recovered after treatment, and the symptoms of the disease are controlled without adverse events; Effective: patients' cardiac function is improved after treatment, and occasional cardiac discomfort does not affect normal life; Ineffective: patients' cardiac function is improved after treatment, and occasional cardiac discomfort does not affect normal life; Ineffective: patients' cardiac function does not meet the above criteria after treatment. Overall effectiveness rates = (significant effects + effectiveness)/total cases × 100%.

Adverse reactions

The number of cases of patients who experienced dyspnoea, minor bleeding and elevated blood uric acid during the treatment period were counted and the incidence of adverse reactions was analysed.

Sample size calculation

Power analysis was performed to calculate the sample size according to the G*Power 3.1.9.7 computer software to determine the sample size required to detect a statistically significant difference. Based on the primary outcome of clinical efficacy, taking into account an α level of 0.05 and 80% efficacy, we calculated that a sample size of 42 patients was required for each group. Considering the potential uncertainties, a sample size of 56 cases per group was chosen for this study, and we believe that the sample size of this study allows for reliable conclusions to be drawn.

Ethical approval

This study was approved by the ethics committee of Lishui People' s Hospital (2025-11).

STATISTICAL ANALYSIS

SPSS27.0 statistical softwares were adopted for the purpose of datasynthesis. Measurements that conformed to normal distributions were expressed by ($\bar{x}$±s), and comparison among groups were made by independent samples *t*-test, and counting data were measured by rate (%) of x^2 test, with $P<0.05$ indicating that the discrepancy was statistical significant.

RESULTS

Basic information

Total 112 patients participated in this study, including 56 receiving clopidogrel and 56 receiving clopidogrel augmented with ticagrelor. Baseline characteristic was comparable among the both groups (table 1). These results suggest that the two groups were well matched in terms of baseline characteristics, minimising the risk of confounding variables that could affect the study outcome.

PAR

The results of the analysis of PAR of both groups are described in fig. 1, the PAR of the both groups of patients was gradually reduced at 2 h, 24 h and 1 week after the operation, Patients in the study group were significantly lower than the control group ($P<0.05$).

Table 1: Baseline characteristics of patients in each group

Parameter	Control group (n=56)	Study group (n=56)	t/x^2	P
Age (years)	60.28±4.16	59.99±3.15	-0.416	0.678
Gender (Male/Female)	29/27	26/30	0.322	0.571
Weight (kg)	61.41±5.08	61.25±6.43	-0.146	0.884
Disease duration (years)	2.98±0.97	3.08±1.36	0.448	0.655

Table 2: Comparisons of lung function indexes ($\bar{x}$±s)

Norm	Time	Control group	Study group
IL-6 (ng/L)	Post-operative 1 week	32.85±1.38	24.89±1.22
	Post-operative 1 month	18.96±0.91*	9.84±0.75*a
sCD40L (pg/L)	Post-operative 1 week	637.06±17.85	587.15±13.48
	Post-operative 1 month	563.27±16.14*	527.44±13.71*a
TNF-α (pmol/L)	Post-operative 1 week	12.53±0.49	8.82±0.97
	Post-operative 1 month	6.33±0.91*	3.27±0.50*a
hs-CRP (mg/L)	Post-operative 1 week	13.08±0.99	8.52±1.08
	Post-operative 1 month	7.09±0.48*	3.38±0.42*a

Note: "*" represents the remarkable discrepancy with post-operative 1 week, P<0.05; "a" represents the remarkable discrepancy with the control group, P<0.05

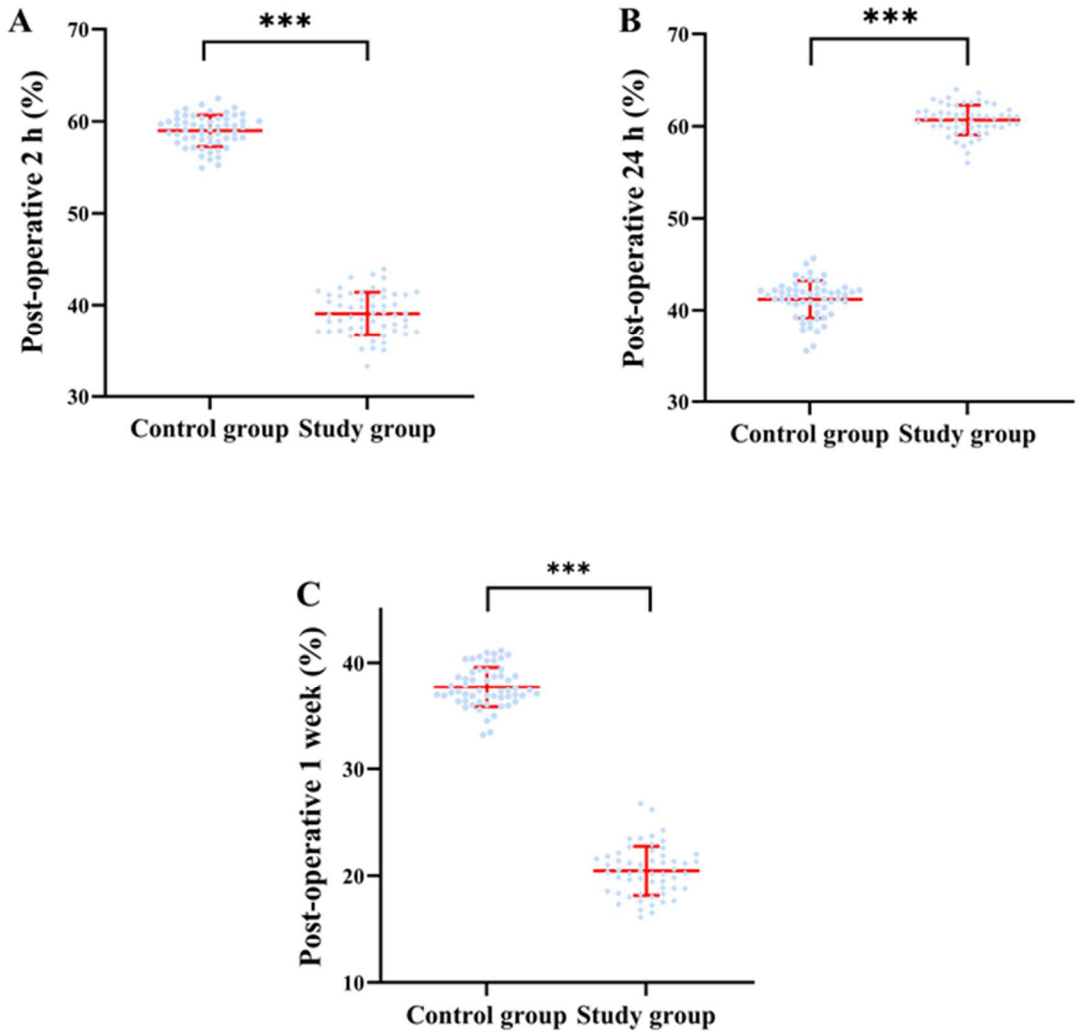

Fig. 1: Comparisons of PAR. (Note: "***" represents P<0.001.)

Table 3: Comparisons of cardiac function indices ($\bar{x}$±s)

Norm	Time	Control group	Study group
LVEDD (mm)	Pre-operative	56.48±5.17	57.46±5.40
	Post-operative 1 week	45.31±6.36*	52.61±3.13*a
LVESD (mm)	Pre-operative	48.78±5.90	48.30±4.59
	Post-operative 1 week	30.75±2.67*	35.78±2.99*a
LVEF (%)	Pre-operative	42.75±6.71	43.19±6.40
	Post-operative 1 week	59.27±5.12*	49.66±4.74*a

Note: "*" represents the remarkable discrepancy with pre-operative, P<0.05; "a" represents the remarkable discrepancy with the control group, P<0.05

Table 4: Comparison of immune function indicators ($\bar{x}$±s, %)

norm	Time	Control group	Study group
CD3+ T cells	Pre-operative	63.96±1.70	64.58±1.74
	Post-operative 1 month	65.07±2.05*	66.75±1.98*a
CD4+ T cells	Pre-operative	35.07±1.81	34.49±2.16
	Post-operative 1 month	35.12±1.94*	38.29±2.21*a
CD8+ T cells	Pre-operative	37.51±2.03	36.99±1.95
	Post-operative 1 month	34.15±2.13*	32.35±1.70*a

Note: "*" represents the remarkable discrepancy with pre-operative, P<0.05; "a" represents the remarkable discrepancy with the control group, P<0.05

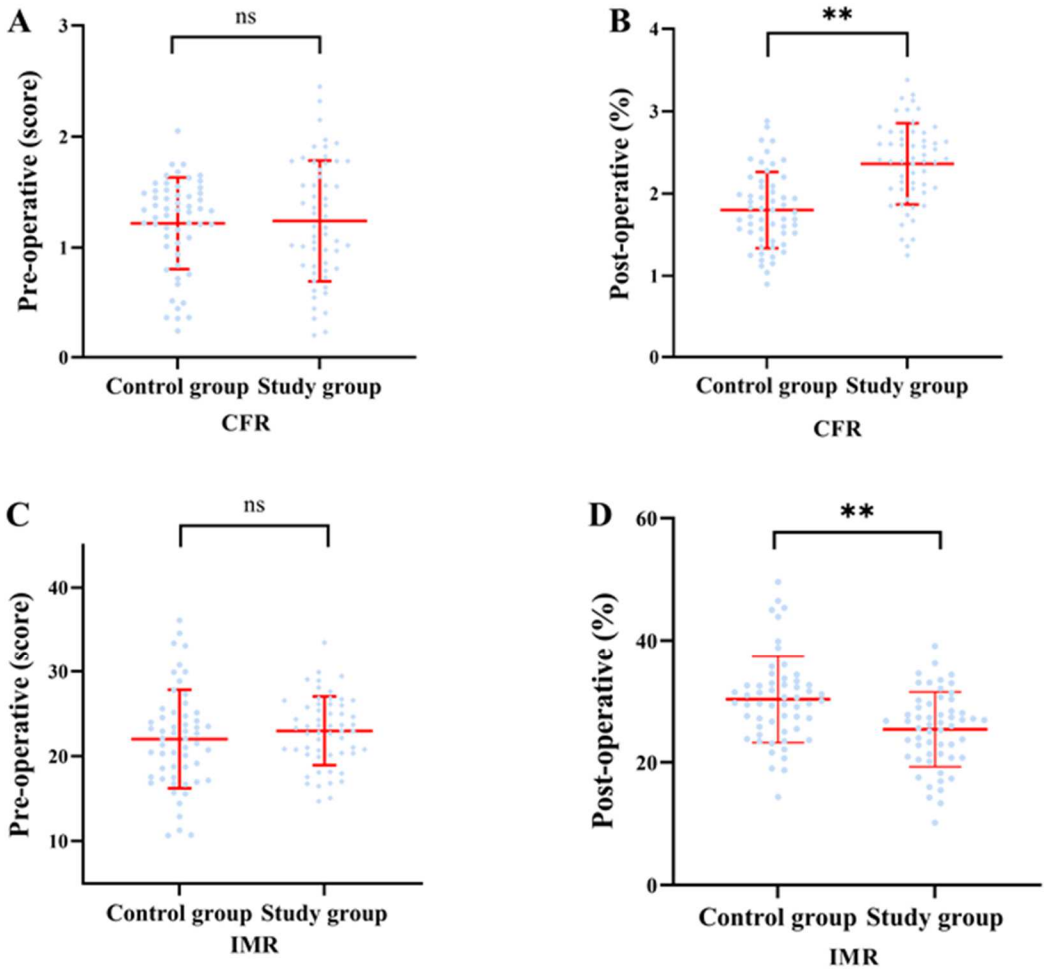

Fig. 2: Comparisons of indicators of microcirculatory function. (Note: "**" represents the remarkable discrepancy with pre-operative, P<0.05)

Table 5: Comparison of total treatment efficiency

Group (*n*=56)	Conspicuous effect	Effective	Ineffective	Overall Effective Rate
Control group	24	22	10	46(82%)
Study group	29	25	2	54(96%)
x^2				10.010
P				<0.05

Table 6: Comparisons of the occurrence of adverse effects (%)

Group (*n*=56)	Dyspnoea	Minor haemorrhage	Elevated blood uric acid	Total incidence
Control group	2	3	2	7(13%)
Study group	1	1	0	2(4%)
x^2				5.207
P				<0.05

Comparison of inflammatory factor indicators

The results of the comparison of the parameters of inflammation factors among both groups of patients are presented in table 2, postoperative 1 month, The levels of IL-6, sCD40L, TNF-α and hs-CRP were lower than postoperative 1 week in both groups, and the indexes of inflammatory factors were significantly lower in the study group than in the control group (P<0.05).

Cardiac function

The results of cardiac function analysis in the both groups are demonstrated in table 3 and the differences in pre-operative LVEDD, LVESD, and LVEF of both groups were not found by statistic signs (P>0.05). At postoperative 1 week, LVEDD, LVESD and LVEF improved in both groups. LVEDD and LVESD were significantly lower in the study group than in the control group, while LVEF was significantly higher than in the control group (P<0.05).

Indicators of immune function

The results of the immune function analysis of the both groups of patients are displayed in table 4 and the percentages of CD3+ T cells, CD4+ T cells, and CD8+ T cells were not statistical differences among the both groups pre-operatively (P>0.05). At post-operative 1 month, CD3+ T cells and CD4+ T cells were elevated in both groups, and CD8+ T cells were lower than preoperative treatment levels. The percentages of CD3+ T cells, CD4+ T cells and CD8+ T cells were better in the study group than in the control group (P<0.05).

Indicators of microcirculatory function

The results of microcirculatory function indexes are shown in fig. 2, preoperatively, not statistically significant differences between CFR and IMR of the both groups (P<0.05). At postoperative 12 months, CFR and IMR were higher than preoperative in both groups, and CFR was higher in the study group than in the control group, while IMR was lower than in the control group (P<0.05).

Assessment of efficacy

The results of the clinic efficiency analysis of both groups of patients are presented in table 5 and the overall effective rate of treatment in the study group was higher than that in the control group and the discrepancy is statistically meaningful (P<0.05).

Incidence of adverse effects

Both groups of patients experienced varying degrees of adverse effects during treatment as shown in table 6, with a markedly decreased incidence of adverse effects in the study group of 4% (2/56) over the control group of 13% (7/56) (P<0.05).

DISCUSSION

The pathogenesis of ACS is complex and is associated with environmental factors, genetic factors and abnormalities in lipid metabolism (H Wang *et al.*, 2022). Coronary heart diseases occurs in the elderly, the disease is very harmful, if you can not get standard timely treatment, with the continuous development of the disease, the death rate is high, most of the patients die because of atherosclerosis and induced thrombus blockage of blood vessels, which in turn causes myocardial necrosis (Ciumărnean *et al.*, 2022). In addition, external environmental factors such as prolonged heavy physical labour, emotional fluctuations caused by a short period of rapid increase in blood pressure, cardiomyocyte load work resulting in increased oxygen consumption, the same insufficient blood supply to the coronary arteries will lead to the onset of ACS, which can severely jeopardise the patient's lives (Damluji *et al.*, 2023; Djuric and Nenadic, 2024).

PCI surgery is a commonly used clinical procedure, which is widely used in the treatment of cardiovascular diseases caused by coronary atherosclerosis. It can effectively improve the situation of coronary artery stenosis, and can inhibit the formation of thrombus, prevent patients from recurring, the therapeutic effect is remarkable, and effectively improve the quality of life of patients (Tong *et al.*, 2024). However, PCI cannot eliminate the cause of the disease, patients still need to continue treatment after

surgery, and during the process of stenting, it is inevitable to damage the vascular endothelial cells, which will activate the body's coagulation mechanism, leading to inflammatory reactions and a higher risk of thrombosis (Hoole and Bambrough, 2020). And since platelet activation is the main factor influencing thrombus formation, antiplatelet therapy should be administered both before and after PCI surgery to ensure a good surgical outcome and to prevent postoperative cardiovascular adverse events (Angiolillo *et al.*, 2022). Clinical treatment of ACS is mostly with ticagrelor and clopidogrel to ameliorate atherosclerosis and to prevent microthrombi from forming in the vasculature by inhibiting platelet activation and aggregation (Shou *et al.*, 2024).

Some studies have reported that clopidogrel has a prolonged onset of action, is metabolised by the liver during catabolism, and has irreversible binding to platelet receptors, affecting the late antiplatelet effect (J Xu *et al.*, 2023). Ticagrelor has anti-inflammatory and antiplatelet effects, which can reduce the extraction rate of adenosine from erythrocytes. Adenosine can have an inhibitory effect on the process of TNF-α release at cardiomyocytes after ischemia/reperfusion in the patient's organism, and improves the myocardial contraction capacity, based on which adenosine inhibits the production of IL-6 to decrease the permeability of blood vessels (Ren, 2024; Tamakauskas *et al.*, 2022). As can be seen from the results of this study (fig. 1), the PAR of patients in the study group was significantly lower than that of the control group at 2h, 24h, and 1 week postoperatively (P<0.05). This suggests that the concomitant use of ticagrelor and clopidogrel can reduce the effect of low platelet aggregation. Inflammatory factors in the development of coronary atherosclerosis are correlated with the risk of cardiovascular events in the body (Mahmoud *et al.*, 2025; Oikonomou *et al.*, 2020). The results of the study in table 2 showed that the levels of all inflammatory factors in patients in the study group were lower than those in the control group at 1 week and 1 month after surgery, and the levels of all inflammatory factors in the 2 groups were significantly lower at 1 month after surgery compared with those at 1 week after surgery (P<0.05). This suggests that the concomitant use of ticagrelor and clopidogrel as an adjunct to PCI in the treatment of acute coronary syndromes can reduce the inflammatory response. In a study by Adali et al. who improved the systemic immune inflammatory index in patients with ACS by ticagrelor, they reported a reduction in the neutrophil-to-lymphocyte ratio and the level of the immune inflammatory index in patients treated with ticagrelor. This is similar to the findings of the present study (Adali *et al.*, 2022).

The outcomes of the study in table 3 showed that post-operative 1 week, cardiac function LVEDD, LVESD and LVEF improved in both groups, with LVEDD and LVESD significantly lower in the study group than in the control group, while LVEF was significantly higher than in the control group (P<0.05), and the results of the study showed that the combination of clopidogrel and ticagrelor could effectively improve the prognosis of patients after PCI, which demonstrated the fact that the combinatory use of clopidogrel and ticagrelor is effectively improve the cardiac function of patients and enhance the prognosis after PCI. In this study (table 4), the proportions of CD3+ T cells and CD4+ T cells were higher and the proportions of CD8+ T cells were lower than preoperative in patients in the study group 1 month after surgery. The proportions of CD3+ T cells and CD4+ T cells in the study group were significantly higher than those in the control group, and the proportion of CD8+ T cells was lower than that in the control group (P<0.05), indicating that the combination of clopidogrel and ticagrelor can improve the postoperative inflammatory response and enhance the immune function of patients. In addition, the results in fig. 2 showed that CFR and IMR were higher in both groups after treatment than before treatment, and CFR was higher in the study group than in the control group, while IMR was lower than in the control group (P<0.05). Meanwhile, the total clinical effectiveness rate (table 5) was higher and the total incidence of cardiovascular and other adverse reactions (table 6) was lower in the study group than in the control group (P<0.05). Xu et al. in a study of clopidogrel in combination with ticagrelor in patients with acute ST-segment elevation myocardial infarction reported that the treatment improved patients' haemorheological indices, increased clinical efficacy, and reduced adverse effects. This is consistent with the findings of the present study (S Xu *et al.*, 2024). It showed that the simultaneous application of ticagrelor and clopidogrel in PCI patients could promote the recovery of coagulation function, alleviate platelet aggregation phenomenon in vivo, and gradually restore platelet function to normal. The reason for this is that clopidogrel is a precursor drug with no pharmacological activity that would lead to permanent inactivation of platelets, and the binding of ticagrelor to the P2Y12 receptor does not change the receptor conformation, so that the adverse effects on the patient's coagulation function are relatively small, and platelet function can be restored as early as possible after discontinuation of the drug (Jiang *et al.*, 2022; Khalil *et al.*, 2024). Ticagrelor and clopidogrel can act synergistically to improve body tolerance, ensure drug safety, and reduce the incidence of cardiovascular adverse events during patient treatment.

This study combines ticagrelor and clopidogrel, two common postoperative antiplatelet aggregation drugs for PCI, to provide new therapeutic ideas and approaches for the management of interventional procedures in patients with ACS. At the same time, this study not only focused on the PAR and inflammatory factor level, but also tested the cardiac function indexes, immune function indexes

and microcirculation function indexes, so as to comprehensively evaluate the therapeutic effect. However, this study has some limitations. The sample size was relatively limited and did not cover the different conditions of all the patients concerned, which may cause bias in the results of the study and thus adversely affect the extrapolation and reliability of the conclusions. Individual differences in the underlying conditions of patients may also interfere with the generalisability of the study results. In addition, due to the short follow-up period, the long-term efficacy and safety of the treatment could not be adequately assessed. Therefore, it is advisable to further expand the sample size and extend the follow-up period in order to more comprehensively assess the efficacy and safety of the combination therapy in ACS patients.

CONCLUSION

This study analyses the efficacy of ticagrelor and clopidogrel in the treatment of patients with ACS, in order to provide a new reference for the treatment of this type of disease. The results showed that after the combined treatment, the PAR, inflammation index, cardiac function index, immune function and microcirculation function index of the patients were improved, and at the same time, the incidence of adverse reactions was reduced, which provides a scientific basis for the clinical treatment of related diseases. However, the present study has a small sample size and a short follow-up period, and fails to observe the long-term effectiveness of this method of treatment. Multi-centre, large-sample, high-quality clinical studies can be continued for verification in the later stage.

Conflicts of interest

The authors declare that they have no financial conflicts of interest.

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