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Systematic Review

Comparison of the Efficacy of Dual Antiplatelet Treatment at Different Treatment Times in Patients with High Bleeding Risk after PCI: A Systematic Review and Meta-analysis of Randomized Controlled Trials

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Abstract

Objective: This study conducted a systematic review and meta-analysis to evaluate the efficacy and complications of dual antiplatelet therapy in patients with high bleeding risk after percutaneous coronary intervention (PCI) at different treatment durations. **Methods**: Related studies were searched in PubMed, Web of Science, Cochrane Library, Google Scholar, China national knowledge infrastructure (CNKI), Wanfang, Embase, and VIP databases from the establishment of the database to May 2023. Randomized controlled trials (RCTs) of dual antiplatelet treatment (DAPT) time limit for germination of the coronary artery were screened, and results were integrated and analyzed. The study assessed literature quality using the Jadad scale and conducted meta-analyses with RevMan 5.4, applying appropriate models based on heterogeneity and using Egger's test for publication bias. Sensitivity analysis identified factors contributing to heterogeneity. **Results**: Fifteen studies with 193,086 patients with PCI, comprising 102,661 cases of DAPT short-term treatment groups ($<$12 months) and 88,988 cases of DAPT long-term treatment groups ($\geq$12 months), were analyzed. Meta-analysis results showed that the total mortality of short-term DAPT PCI was significantly reduced compared with long-term treatment (relative risk (RR) = 0.49, 95% CI: 0.48–0.51). Cardiac mortality showed a significant decrease (RR = 0.50, 95% CI: 0.48–0.52); Myocardial infarction: The risk of myocardial infarction was significantly reduced (RR = 0.68, 95% CI: 0.66–0.70); There was a significant increase in the risk of stroke (RR = 1.45, 95% CI: 1.37–1.53); The incidence of target vessel revascularization (TVR) showed a significant increase (RR = 1.35, 95% CI: 1.08–1.69); The risk of major bleeding was significantly increased (RR = 1.46, 95% CI: 1.40–1.51). Definite stent thrombosis and incidence of minor bleeding did not increase significantly. **Conclusion**: Short-course dual antiplatelet therapy (DAPT) has been shown to decrease overall mortality, cardiac mortality, and the risk of myocardial infarction in patients following percutaneous coronary intervention (PCI). However, it is associated with an elevated risk of major bleeding, stroke, and target vessel revascularization (TVR), while the risks of definite stent thrombosis and minor bleeding did not increase significantly. Additional high-quality RCTs should be used to verify the conclusions.

Keywords

percutaneous coronary intervention; dual antiplatelet therapy; randomized controlled trial; meta-analysis

Introduction

Cardiovascular disease is the leading cause of death worldwide. According to the World Health Organization, approximately 17.9 million people die from cardiovascular diseases every year, accounting for one-third of the global death toll [1,2]. The "China Cardiovascular Health and Disease Report 2021" pointed out that the prevalence rate of cardiovascular disease in China continuously increases, and death from cardiovascular disease is the first cause of death among urban and rural residents in China [3]. By 2030, the number of acute myocardial infarction patients in China is projected to increase to 22.6 million from 8.1 million in 2010 [4]. The rise in coronary atherosclerotic heart disease incidence and mortality in the country is attributed to modern lifestyle changes, high-fat diet, lack of exercise, hypertension, diabetes, and other chronic diseases. Patients with acute or chronic coronary syndromes are typically categorized as high bleeding risk [5,6].

Percutaneous coronary intervention (PCI) is a common method for treating cardiovascular diseases, quickly reducing coronary artery blockages and restoring blood flow to the heart. Although the prevalence rate is low, the consequences of stent thrombosis are serious, and the mortality rate can reach 45% [7]. Platelets play a key role in mediating thrombosis, so dual antiplatelet therapy (DAPT) is the cornerstone of post-PCI treatment for cardiovascular diseases and the cornerstone of preventing the recurrence

of cardiac and systemic ischemic events in patients after PCI. DAPT is important maintain patient life and ensure safety and restore myocardial blood supply. It can significantly reduce the risk of ischemic events in patients after PCI [8]. Current guidelines generally recommend aspirin combined with a P2Y12 platelet receptor inhibitor as a standardized initial DAPT strategy after PCI, and this regimen should be administered to patients with stable coronary artery disease (SCAD) for at least 6 months [9]. In patients with acute coronary syndrome (ACS), DAPT should be conducted for at least 12 months [7,10,11]. In 2018, the American College of Cardiology/American Heart Association (ACC/AHA) recommended that DAPT treatment be continued for at least 12 months after drug-eluting stent implantation [12]. However, the time limit of DAPT treatment after PCI is still controversial [13] and deserves further clinical research.

Although long-term dual antiplatelet therapy has a significant effect in reducing the occurrence of cardiovascular ischemic events, it is also accompanied by an increased risk of bleeding [14–16]. With the continuous improvement of new-generation drug-eluting stents and the advancement of PCI technology, the risk of stent thrombosis has been significantly reduced [17–19]. The "East Asian Paradox" found that under the same antiplatelet therapy, East Asian populations have higher platelet reactivity but lower ischemic risk than Western populations [20,21]. In recent years, foreign studies have shown that short-term DAPT can reduce the risk of bleeding events without increasing the risk of ischemia, but some studies have shown that 6-month DAPT may increase the incidence of myocardial infarction [22]. Therefore, the safety of short-term DAPT after PCI remain a clinical controversy, and a large amount of research is urgently needed to explore the safety of short-term DAPT. This article aims to evaluate the efficacy and safety of DAPT of $<$12 months and DAPT of $>$12 months by searching domestic and foreign randomized controlled studies on the time limit after PCI. Results provide a reliable theoretical basis for clinical guidance of a reasonable time limit for DAPT after PCI.

Data and Methods

Literature Search Strategy

Specific and systematic searches were carried out in the webpage, databases PubMed, Embase, Web of Science, Cochrane Library, Google Scholar, China national knowledge infrastructure (CNKI), Wanfang and VIP databases. The search terms were: "Percutaneous coronary intervention", "Coronary stent", "Dual antiplatelet therapy", "Random". The search time limit was from the establishment of the database to May 2023. The search results are limited to clinical research and are not restricted by language or race. Manual searches are performed by reading relevant works and summarizing references. Search strategies need to be adjusted to comply with the relevant regulations in every database.

Literature Inclusion Criteria

(1) The study utilized randomization to compare the outcomes of long-term dual antiplatelet therapy (DAPT) versus short-term or no DAPT, with endpoints including total or cardiovascular mortality, ischemic vascular disease (IVD) recurrence, and bleeding.

(2) DAPT patients after PCI.

(3) Intervention measures: Experimental group: short-course DAPT treatment after PCI ($<$12 months); control group: long-course DAPT treatment after PCI ($>$12 months).

Literature Exclusion Criteria

The following criteria were employed: (1) non-randomized trials; (2) duplicate publications or data duplication; (3) without the control group; (4) animal experiments; (5) research methods, results, and conclusions that cannot be explained or do not correspond to one another; (6) statistical methods and data analysis that have obvious errors; (7) literature with imperfect experimental design; (8) literature for which data could not be extracted or data were incomplete; (9) duplicate publications; (10) case reports, reviews, conference papers, abstracts test results and conclusions are obviously inconsistent with the reality; (11) less than two outcome measures; and (12) non-Chinese and English literature.

Literature Screening and Data Extraction

Literature screening: Two researchers independently screened the literature, targeting titles and abstracts by using the inclusion and exclusion criteria through primary screening, secondary screening, and cross-checking to determine possible relevant studies. Firstly, preliminary screening was conducted. The titles and abstracts of the articles were read and analyzed. Literature that apparently did not met the inclusion criteria or was duplicate studies were eliminated. Secondly, re-screening was performed, where the full text of the papers from the primary screening were obtained and the literature was further screened according to the inclusion criteria. Finally, papers were cross-checked. For documents with incomplete or questionable information, the corresponding authors were contacted for detailed information. Finally, the inclusion of the study was judged. If two researchers have different opinions on some articles, then they will discuss them together until a consensus is reached; if no consensus can be reached, then a third researcher will participate in the judgment. Finally, the selected documents are included in the table for extraction and summary.

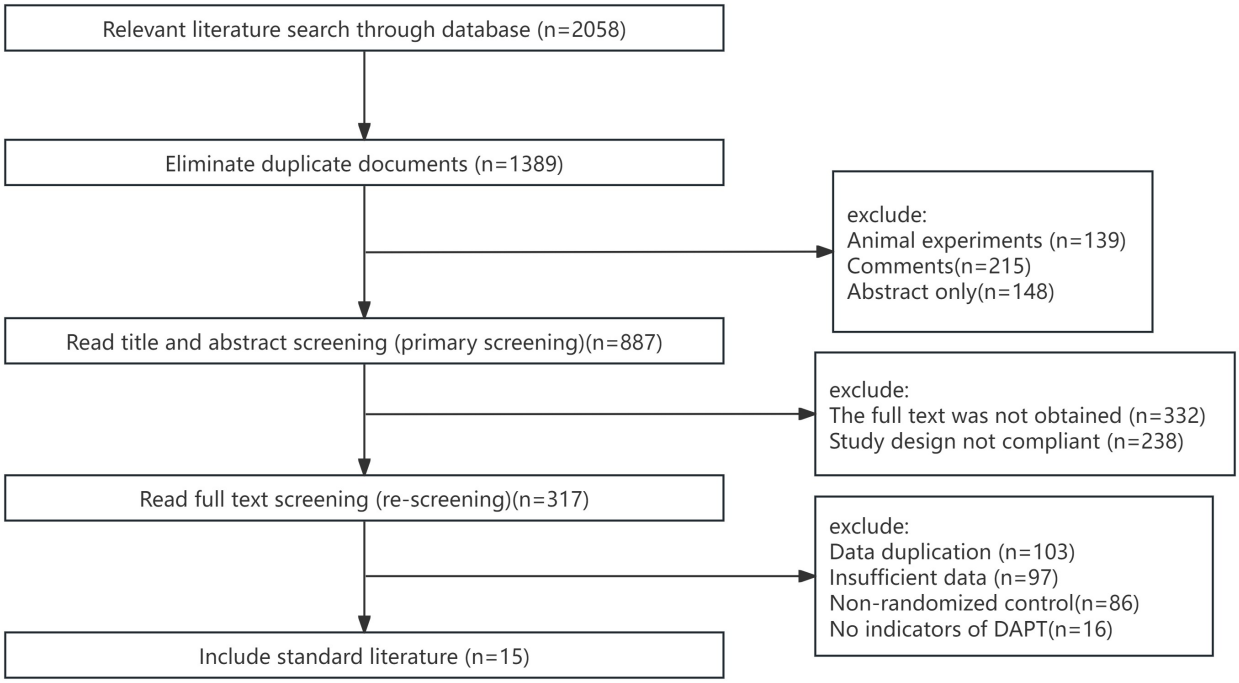

Fig. 1. Flow chart of literature search.

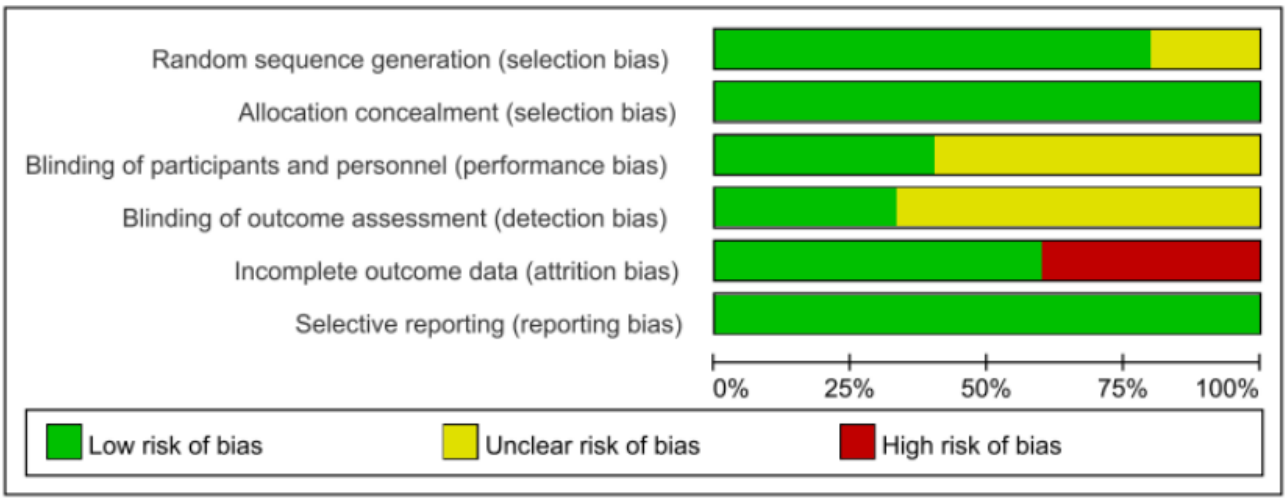

Fig. 2. Risk of bias bar plot.

Data extraction: The content of data extraction includes title, first author, year of publication, research type, and observation indicators.

Efficacy Index

① Total mortality rate;
② Cardiac mortality;
③ Myocardial infarction;
④ Stroke;
⑤ Definite stent thrombosis;
⑥ TVR (target vessel revascularization) ;
⑦ Incidence of major bleeding;
⑧ Incidence of minor bleeding.

Quality Evaluation

Eligible literature was assessed for methodological quality by using the Jadad scoring scale (on a scale of 1 to 7). Random sequence generation, blinding, allocation concealment, and patient withdrawal were assessed. A Jadad score of 4–7 was considered high-quality literature, and 1–3 was considered low-quality literature.

Fig. 3. Risk of bias summary.

Statistical Method

All analyses were pooled using RevMan 5.4 statistical software (Cochrane, Oxford, UK), with weighted mean differences (WMD) and 95% confidence intervals (CI) for continuous data and relative risk (RR) and 95% CI for dichotomous data. The heterogeneity index (I^2) was used to evaluate the heterogeneity of the treatment effect. When there was no significant heterogeneity between studies ($I^2 < 50\%$) or the source of heterogeneity was resolved, the fixed-effect model was adopted. When there was significant heterogeneity ($I^2 \geq 50\%$) or the source of heterogeneity could not be found, the random effects model was used. Egger's test was used to assess the potential risk of publication bias. Sensitivity analysis was performed on factors that may cause heterogeneity, and literature with high sensitivity was excluded. A descriptive analysis was performed for those who could not perform a meta-analysis. Tests of significance were two-sided, with alpha level of 0.05.

Results

Literature Search Results

This study conducted systematic retrieval of the original literature on PCI, coronary stent, DAPT, and random published in databases such as CNKI, Wanfang, VIP, EMBASE, Web of Science, Cochrane Library, and PubMed by using subject headings combined with free words. A total of 2058 studies were manually retrieved, including 502 articles were repeatedly published or were animal experiments; 887 articles were obtained. After reading the full text, 570 articles that could not meet the criteria with regard to the full text and had incomplete experimental design were eliminated. Finally, 15 articles were obtained [23–37]. The literature screening process is shown in Fig. 1.

Basic Characteristics and Quality Evaluation of Included Literature

The demographic characteristics and baseline characteristics of the patients are shown in Table 1 (Ref. [23–37]). The patients were divided into different subgroup groups based on the time of the study. The Jadad score of the included literature was 4 to 5, which indicated high-quality literature, and none of the 15 included studies had withdrawal.

Risk of Bias Results

In order to assess the risk of bias, we used the Cochrane risk assessment tool to conduct an item-by-item evaluation of each included study through the following 6 evaluation criteria.

(1) Random sequence generation;
(2) Allocation concealment;
(3) Blinding of participants and personnel;
(4) Blinding of outcome assessment;
(5) Incomplete outcome data;
(6) Selective reporting.

The risk of bias (Figs. 2,3) analyses showed that most of the studies included in this study correctly described the generation of random sequences. As for allocation concealment, implementer-participant double-blinding is not described very comprehensively in most studies.

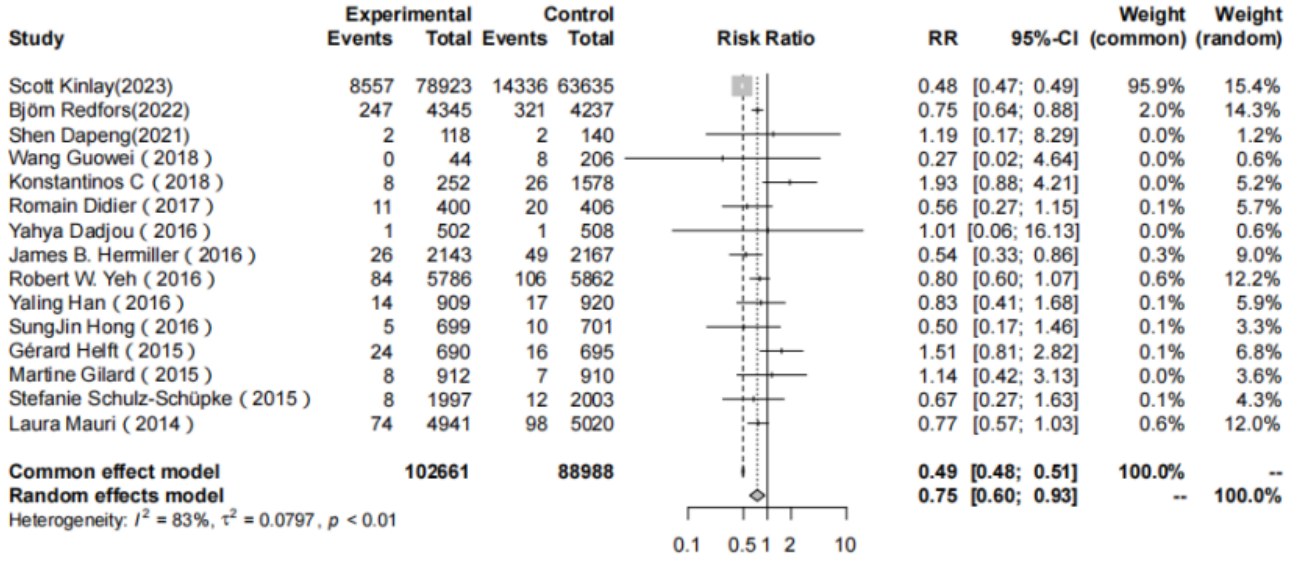

Fig. 4. Meta-analysis forest plot of total mortality rate.

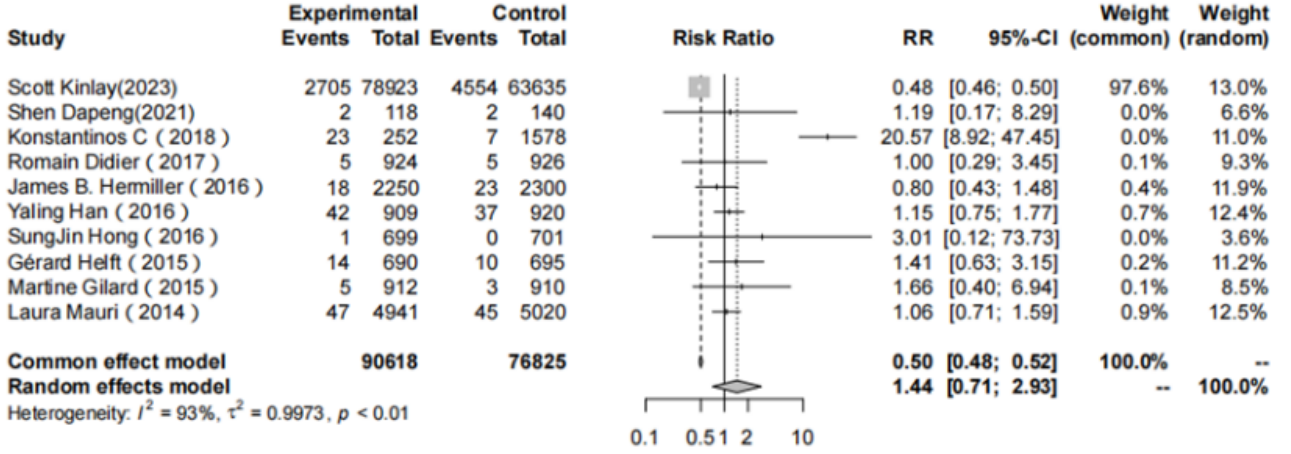

Fig. 5. Total mortality funnel plot.

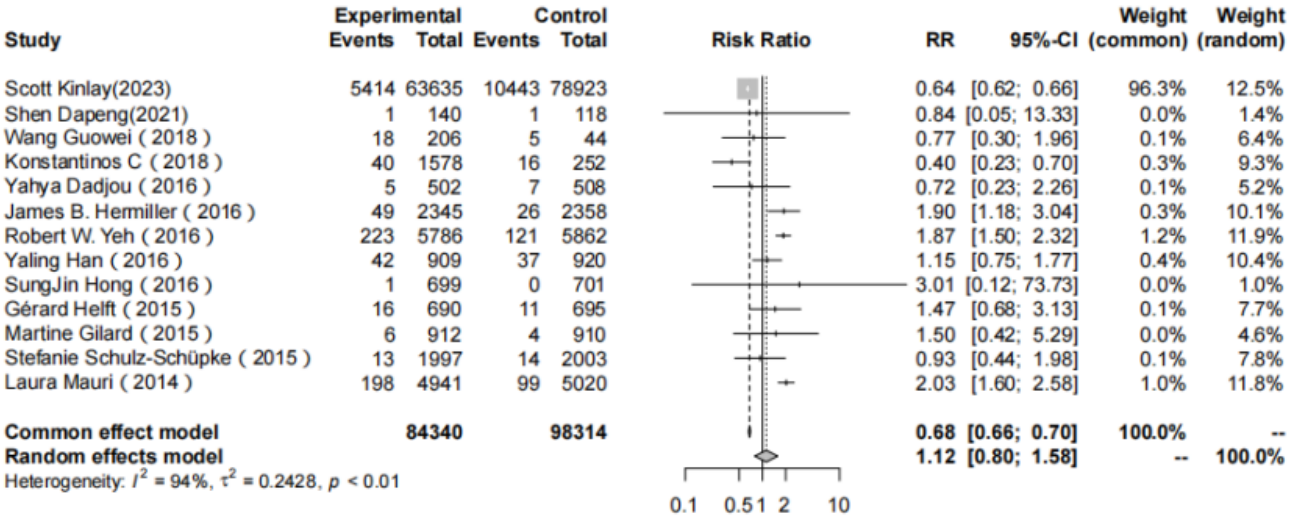

Fig. 6. Meta-analysis forest plot of Cardiac mortality rate.

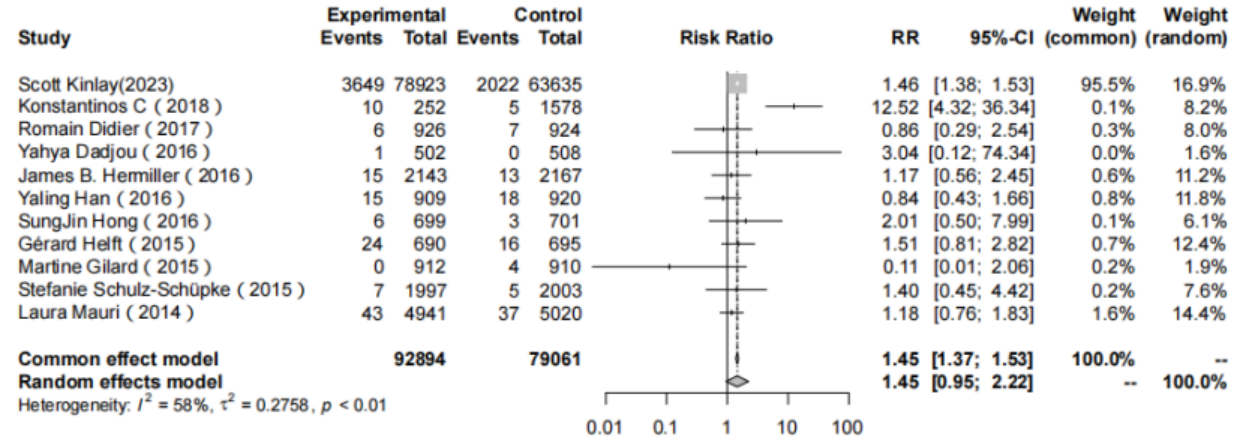

Fig. 7. Meta-analysis forest plot of incidence of Myocardial infarction.

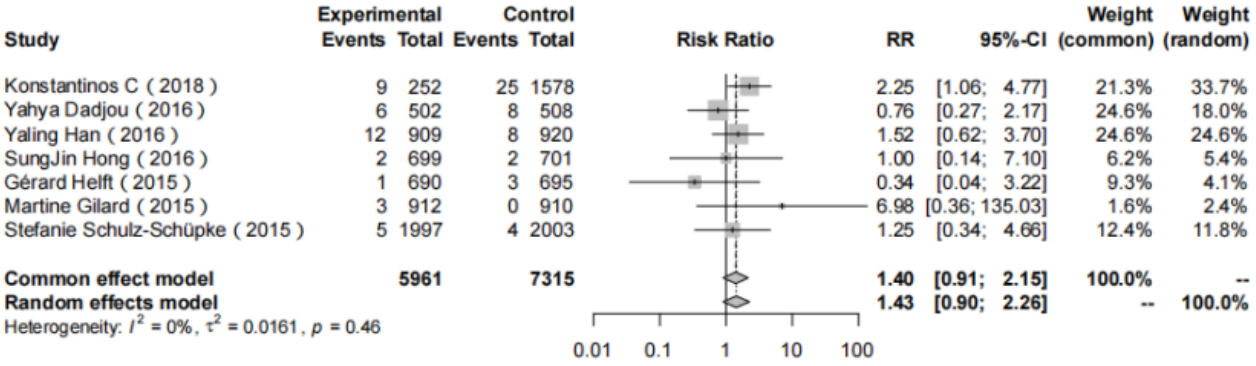

Fig. 8. Meta-analysis forest plot of incidence of stroke.

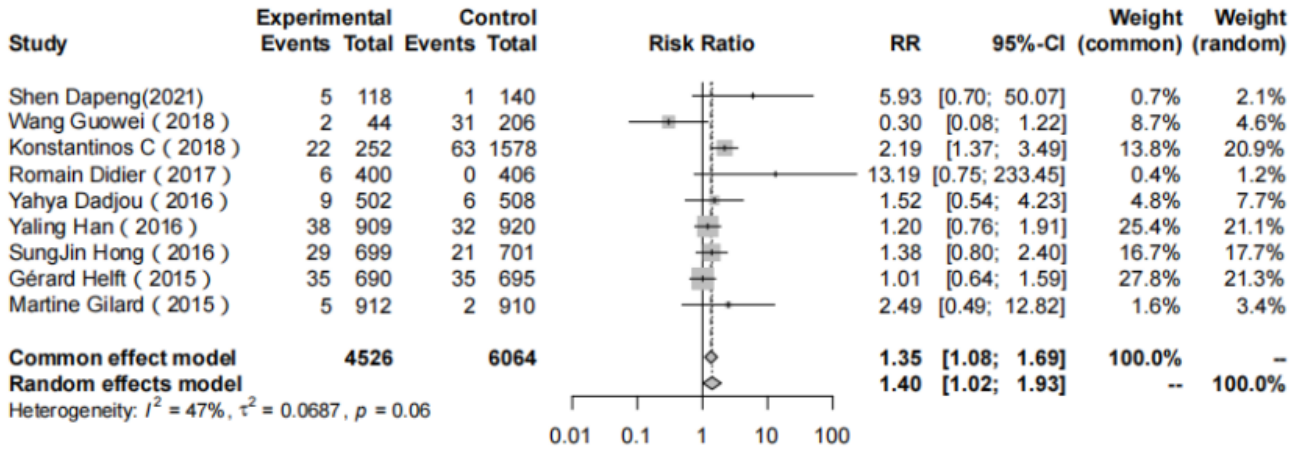

Fig. 9. Meta-analysis forest plot of incidence of stent thrombosis.

Efficacy Index Results

Total Mortality Rate

All 15 studies [23–37] reported the total mortality rate and included 193,086 research subjects. As shown in Fig. 4, the heterogeneity test showed I^2 = 83%. The results of meta-analysis using the fixed effect model showed that p < 0.01 (RR = 0.49, 95% CI: 0.48–0.51). A funnel plot was made for each study, and the results showed that the distribution of each study on both sides of the funnel plot was almost symmetrical, so the included studies were less likely to have publication bias (Fig. 5). The Egger test showed significant asymmetry (t = 3.77, df = 13, p = 0.0023), indicating potential publication bias favoring studies with significant results.

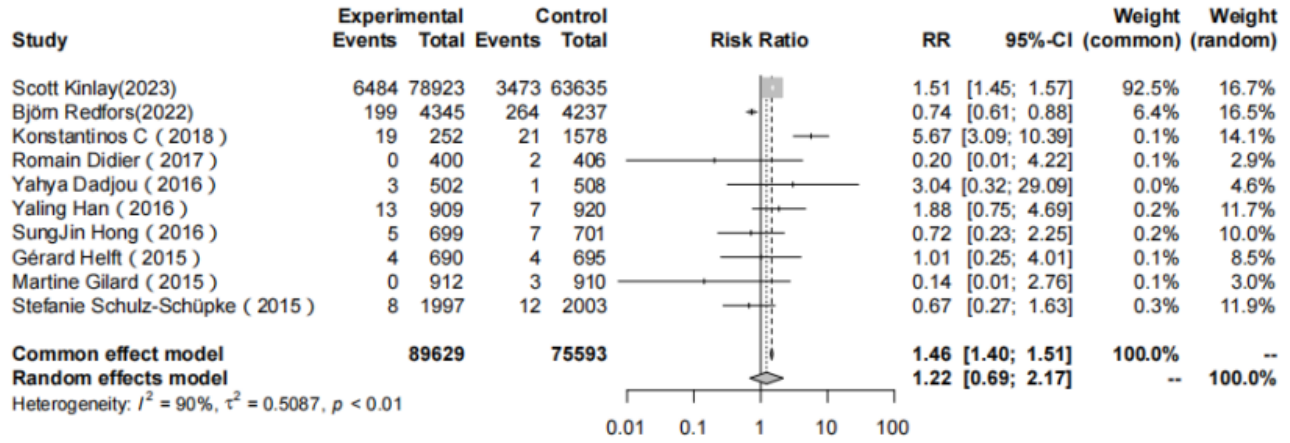

Fig. 10. Meta-analysis forest plot of incidence of target vessel revascularization (TVR).

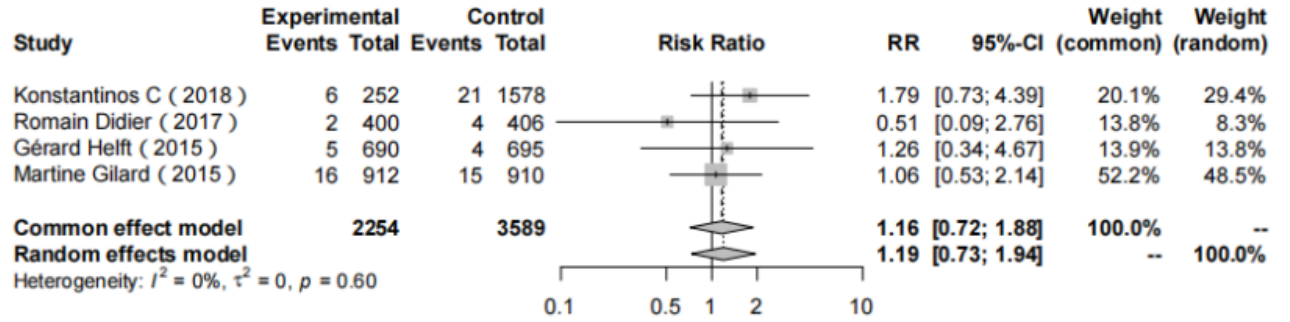

Fig. 11. Meta-analysis forest plot of incidence of major bleeding.

Therefore, we performed a relevant subgroup analysis **(Supplementary Table 1)**. The heterogeneity of subgroup allocation according to length of time was 36.2%. Sensitivity analysis was conducted by excluding the literature one by one. We found that the study of Kinlay *et al*. [23] was a source of high heterogeneity, because after excluding this article, the heterogeneity was 0%. The PRISMA checklist has been used during the research **(Supplementary Table 2)**.

Cardiac Mortality Rate

Ten studies [23,25,27,28,30,32–35,37] reported cardiac mortality rate. As shown in Fig. 6, the heterogeneity test results showed: I^2 = 93%. The meta-analysis results using the fixed effects model showed $p < 0.01$ (RR = 0.50, 95% CI: 0.48–0.52). The Egger test yielded a statistically significant result (t = 3.27, df = 8, p-value = 0.0114). There is a possibility of asymmetry in the funnel plot.

Therefore, we performed relevant subgroup analysis **(Supplementary Table 1)**. The results showed that the heterogeneity in subgroup allocation according to length of time was 74%. A sensitivity analysis was conducted by excluding any of the documents one by one. After excluding the study of Koskinas *et al*. [28], the heterogeneity was 0%, indicating that this study was the source of heterogeneity.

Myocardial Infarction

All 13 [23,25,26,28–37] studies reported myocardial infarction. The heterogeneity test results showed I^2 = 94%, and the meta-analysis results using the fixed effects model showed $p < 0.01$ (RR = 0.68, 95% CI: 0.66–0.70) (Fig. 7). The Egger's test yielded no statistically significant results (t = 2.18, df = 11, p-value = 0.0523), suggesting that there is insufficient statistical evidence to indicate the existence of publication bias, but asymmetry may still exist in the funnel plot.

Therefore, we performed a relevant subgroup analysis **(Supplementary Table 1)**. The heterogeneity in subgroup allocation according to length of time was 75.1%. A sensitivity analysis was performed by excluding any articles one by one. After excluding the studies of Shen *et al*. [25] and Hong *et al*. [33], the heterogeneity was 0%, indicating that these articles were the source of heterogeneity.

Stroke

Eleven studies [23,27–30,32–37] reported on stroke. The heterogeneity test results showed: I^2 = 58%, and the meta-analysis results using the fixed effects model showed $p < 0.01$ (RR = 1.45, 95% CI: 1.37–1.53) (Fig. 8). The Egger's test yielded no statistically significant results (t =

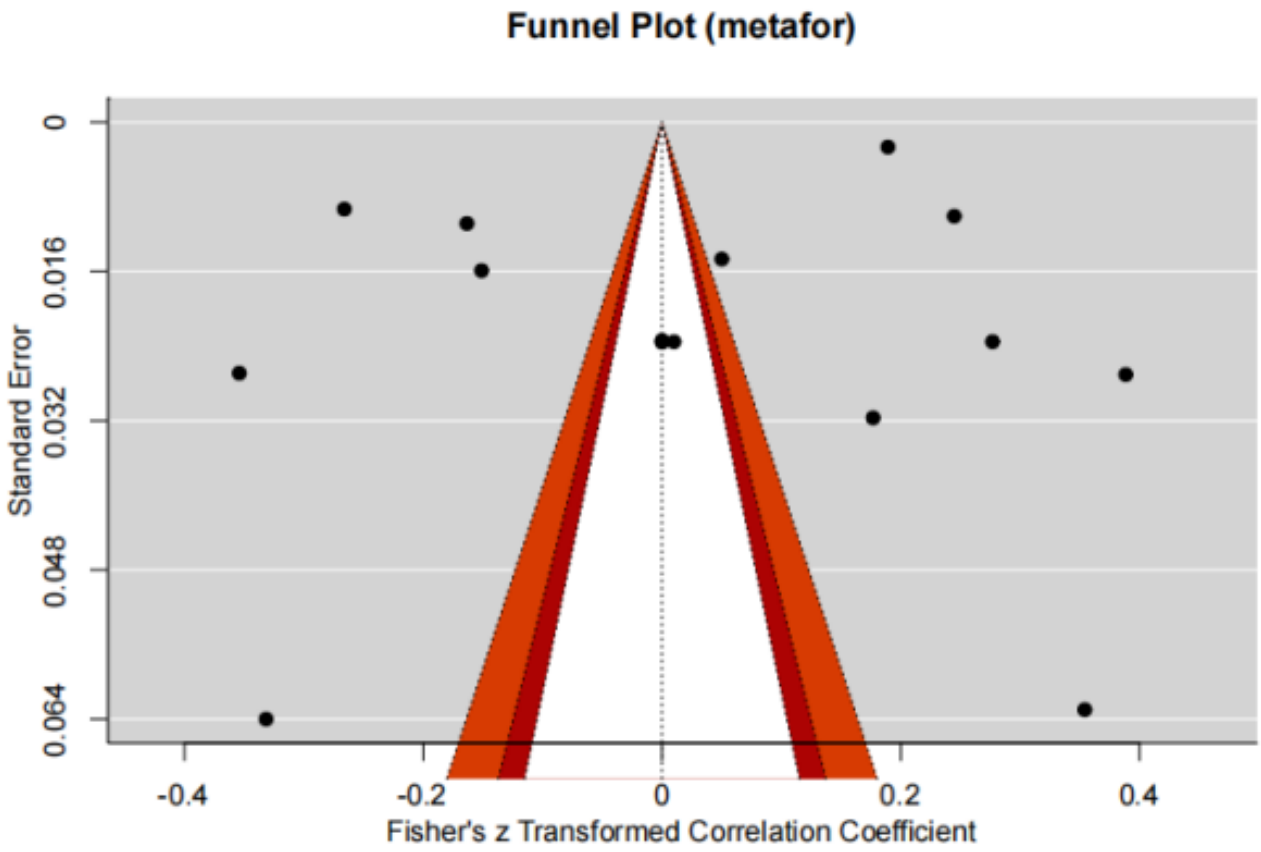

Fig. 12. Meta-analysis forest plot of incidence of minor bleeding.

–0.13, df = 9, *p*-value = 0.8961), suggesting that there is insufficient statistical evidence to indicate the existence of publication bias, but asymmetry may still exist in the funnel plot.

Therefore, we performed a relevant subgroup analysis **(Supplementary Table 1)**. The heterogeneity in subgroup allocation according to length of time was 17.8%. Sensitivity analysis was performed by excluding the literature one by one. After excluding the studies of Kinlay *et al*. [23] and Hong *et al*. [33] at the same time, the heterogeneity was 0%, indicating that these articles were sources of heterogeneity.

Definite Stent Thrombosis

Seven studies [28,29,32–36] reported the incidence of stent thrombosis. Among the included studies, the heterogeneity I^2 was 0%, and the meta-analysis results using the fixed effects model showed $p < 0.01$ (RR = 1.40, 95% CI: 0.91–2.15) (Fig. 9). This finding shows that the meta-analysis is reliable. The number of studies (7) was too small to perform Egger's test to view the results of publication bias.

Target Vessel Revascularization (TVR)

Nine studies [25–29,32–35] reported on TVR. Among the included studies, heterogeneity I^2 was 49%, and the meta-analysis results using the fixed effects model showed $p < 0.01$ (RR = 1.35, 95% CI: 1.08–1.69) (Fig. 9). The number of studies (9) was too small to perform Egger's test to view the results of publication bias.

Therefore, we performed relevant subgroup analysis (Fig. 10). The heterogeneity in subgroup assignment according to length of time was 0%. Sensitivity analysis was performed by excluding the literature one by one. After excluding the studies of Shen *et al*. [25], Wang *et al*. [26], and Han *et al*. [32] at the same time, the heterogeneity was 0%, indicating that these articles were the sources of heterogeneity.

Incidence of Major Bleeding

Ten studies [23,24,27–29,32–36] reported on TVR. Among the included studies, heterogeneity I^2 was 90%, and the meta-analysis results using the fixed effects model showed $p < 0.01$ (RR = 1.46, 95% CI: 1.40–1.51) (Fig. 11). The Egger's test yielded no statistically significant results (t = –0.75, df = 8, *p*-value = 0.4775), suggesting that there is insufficient statistical evidence to indicate the existence of publication bias, but asymmetry may still exist in the funnel plot.

Therefore, we performed relevant subgroup analysis **(Supplementary Table 1)**. The heterogeneity in subgroup

Table 1. Basic characteristics and Jadad score of included studies.

Researcher	Number of cases (<12 m/≥12 m DAPT treatment)	DAPT time limit (month)	Research design	Efficacy index	Follow-up time/month	Treatment	Jadad score
Kinlay *et al.* [23] (2023)	78,923/63,635	<9 *vs.* >9	Multicenter RCT	①②③④⑦	28–78	second-generation drug-eluting stents	5
Redfors *et al.* [24] (2022)	4345/4237	6 *vs.* 24	Multicenter RCT	①⑦	24	coronary drug-eluting stents	5
Shen *et al.* [25] (2021)	118/140	<12 *vs.* >12	Single center RCT	①②③⑥	30–65	/	4
Wang *et al.* [26] (2018)	44/206	<12 *vs.* >12	Single center RCT	①③⑥	59.79 ± 5.25	/	4
Koskinas *et al.* [28] (2018)	252/1578	<12 *vs.* >12	Multicenter RCT	①②③④⑤⑥⑦⑧	12	/	4
Didier *et al.* [27] (2017)	926/924	6 *vs.* 24	Multicenter RCT	①②④⑥⑦⑧	24	drug-eluting stent	4
Dadjou *et al.* [29] (2016)	502/508	<12 *vs.* >12	Single center RCT	①③④⑤⑥⑦	24	clopidogrel	5
Hermiller *et al.* [30] (2016)	2358/2345	12 *vs.* 30	Multicenter RCT	①②③④	30	clopidogrel	4
Yeh *et al.* [31] (2016)	5786/5862	12 *vs.* 30	Multicenter RCT	①③	30	/	4
Han *et al.* [32] (2016)	909/920	6 *vs.* 12	Multicenter RCT	①②③④⑤⑥⑦	18	/	5
Hong *et al.* [33] (2016)	699/701	6 *vs.* 12	Multicenter RCT	①②③④⑤⑥⑦	12	/	5
Helft *et al.* [34] (2016)	690/695	12 *vs.* 48	Multicenter RCT	①②③④⑤⑥⑦⑧	48	/	5
Gilard *et al.* [35] (2015)	912/910	6 *vs.* 24	Multicenter RCT	①②③④⑤⑥⑦⑧	36	/	5
Schulz-Schüpke *et al.* [36] (2015)	1997/2003	6 *vs.* 12	Multicenter RCT	①③④⑤⑦⑧	12	/	5
Mauri *et al.* [37] (2014)	4941/5020	12 *vs.* 30	Multicenter RCT	①②③④	30	/	5

DAPT, dual antiplatelet treatment; RCT, randomized controlled trial.

assignment according to length of time was 30%. Sensitivity analysis was performed by excluding the literature one by one. After excluding the studies of Redfors *et al.* [24] and Dadjou *et al.* [29], the heterogeneity was 0%, indicating that these two articles were the source of heterogeneity.

Incidence of Minor Bleeding

Four [27,28,34,35] studies reported the incidence of minor bleeding. In the included studies, heterogeneity I^2 was 0%, and the meta-analysis results using a fixed effect model showed $p > 0.05$ (RR = 1.16, 95% CI: 0.72–1.88) (Fig. 12). This finding shows that the meta-analysis is reliable. The number of studies was too small to perform Egger's test to view the results of publication bias.

Discussion

In recent years, research focused on the application of DAPT after PCI for surgery of patients with coronary heart diseases and explored the effect of the suspension of DAPT on prognosis. A study found that after three months of DAPT, it was changed to the risk of patients with ischemia and bleeding incidents in DAPT. However, the above research cannot be confirmed as to whether the data use time will increase or reduce the incidence of adverse reactions [38,39].

This study is included in a total of 15 forward-looking random control experiments, and 12 of them are multicentered RCTs. A total of 193,086 patients with PCI were

patients with 102,661 cases of DAPT short-term treatment groups (<12 months), and 88,988 cases of DAPT long-term treatment groups (≥12 months). The 13 RCT describes the specific random steps and allocation concealment. Two RCTs use double blindness, 1 RCT uses single blindness, and 6 RCTs all mention specific outdoor or exit cases. The overall quality of the research is high. The results of this study showed that PCI's short-term treatment (<12 months) DAPT therapy and a long course of treatment (≥12 months) DAPT therapy was not significantly different from the pericardial mortality rate, which was consistent with the results of the study [40]. However, the results of this study found that the total mortality rate (all due to mortality) of the DAPT treatment group (<12 months) The DAPT treatment group (all due to mortality) (≥12 months) DAPT treatment group was significantly reduced, and the difference was statistically significant. This result proves that PCI's postoperative long course (≥12 months) DAPT may increase the total mortality of patients. It is also possible that due to the increase in time, the mortality rate will also increase after normal surgery. Longer durations of DAPT may lead to increased major bleeding incidents. A meta-analysis found that short-term DAPT had a 37% lower risk of major bleeding events compared to prolonged DAPT at the 1-year mark. This reduction was even greater for patients with MI, reaching 45%. Major bleeding events are often associated with higher mortality rates.

The results of this study showed that short therapy (<12 months) DAPT treatment reduced the main bleeding risk of patients after PCI, and the risk of mild bleeding did not significantly reduce. However, the results of this study also found that although the short course of treatment (<12 months) DAPT treatment reduced the main bleeding risk of PCI, it increased the risk of thrombosis and myocardial infarction in the stent. Consistent with previous research results [41–43], so clinically occurred or high-risk patients with more than those in the bracket can properly extend the treatment of dual-combined anti-platelet treatment appropriately. It's important to acknowledge the need for further investigation into the efficacy and safety of shorter treatment durations, such as 6 months, particularly for high-risk patients. Future studies should explore the balance between the benefits of extended therapy and the potential risks associated with prolonged antiplatelet treatment, providing clinicians with more nuanced guidance for patient management. In conclusion, our findings underscore the importance of individualizing treatment duration based on patient risk factors and clinical presentation. By considering the evolving landscape of antiplatelet therapy and conducting more comprehensive analyses, we can continue to optimize treatment strategies and improve outcomes for patients undergoing PCI [32].

No significant differences were found between the risk of stroke and target vascular reconstruction (TVR). Many random control trials and META analysis confirmed that the effectiveness and security of 6 months of DAPT is not inferior to 12 months of DAPT [44,45]. There are studies confirmed that the incidence of target lesions in 6 months and the incidence of net adverse clinical cardiovascular and cerebrovascular events are similar to 12 months of DAPT. The research proved the effectiveness and security of 6 months of DAPT [32,44]. However, another forward-looking, non-inferior study [22] shows that the 6-month DAPT and the anti-platelet scheme of ≥12 months DAPT is not significantly different in terms of ischemia and bleeding risk. However, the incidence of myocardial infarction is twice the long-term DAPT, which indicates that the security of short-term DAPT still requires a large number of tests to verify.

This study proved that short course (<12 months) DAPT treatment can reduce the total mortality and risk of major bleeding in patients after PCI, but at the same time increase the occurrence of stent thrombosis and myocardial infarction in patients. Short-course (<12 months) DAPT treatment did not increase the incidence of cardiac death, stroke, TVR, and minor bleeding in patients after PCI compared with longer-course (≥12 months) DAPT treatment. The above conclusions need to be verified by more high-quality RCTs.

This study has certain limitations: There is a lack of gray literature data, such as unpublished research data, and publication bias is possible. Secondly, some of the included documents did not clearly mention random sampling methods, allocation concealment, and blinding, and certain possibility of selection bias and implementation bias exists. All the above conclusions need to be verified by more high-quality RCTs.

Conclusion

DAPT effectively reduces overall mortality, cardiac mortality, and myocardial infarction risk in patients PCI. Despite these benefits, it carries an increased risk of major bleeding, stroke, and TVR. Therefore, when determining the duration of DAPT after PCI, it is essential to balance the risks of bleeding and ischemia, selecting the appropriate duration based on the patient's individual conditions.

Availability of Data and Materials

The data that support the findings of this study are available on request from the corresponding author, upon reasonable request.

Author Contributions

HY and CW designed the study; all authors conducted the study; HY and YH collected and analyzed the data. HY and QZ participated in drafting the manuscript, and all authors contributed to critical revision of the manuscript for important intellectual content. All authors gave final approval of the version to be published. All authors participated fully in the work, took public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or completeness of any part of the work were appropriately investigated and resolved.

Ethics Approval and Consent to Participate

Not applicable.

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Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.59958/hsf.7419.

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