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Effectiveness and Safety of Ticagrelor Monotherapy After Short-Duration Dual Antiplatelet Therapy in PCI Patients: A Systematic Review and Meta-Analysis

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Dual antiplatelet therapy (DAPT), consisting of aspirin and a P2Y12 inhibitor, is the standard treatment for patients undergoing percutaneous coronary intervention (PCI) with drug-eluting stents (DES). However, the optimal duration of DAPT remains debated due to the need to balance ischemic event reduction with bleeding risks. This study evaluates the efficacy and safety of ticagrelor monotherapy after short-duration DAPT (1 to 3 months) compared to extended DAPT, focusing on major bleeding and cardiovascular outcomes. A systematic review and meta-analysis were conducted in accordance with PRISMA guidelines. Randomized controlled trials (RCTs) comparing ticagrelor monotherapy after short-duration DAPT to extended DAPT were identified from PubMed, Embase, and the Cochrane Library. Data on major bleeding, major adverse cardiovascular and cerebrovascular events (MACCE), myocardial infarction, stroke, stent thrombosis, and mortality were analyzed, and risk ratios (RR) with 95% confidence intervals (CI) were calculated using a random-effects model. Five RCTs involving 32,393 patients were included. Ticagrelor monotherapy significantly reduced MACCE (RR: 0.88; 95% CI: 0.77 to 0.99; p = 0.04) and major bleeding (RR: 0.53; 95% CI: 0.37 to 0.77; p = 0.0008) compared to extended DAPT. It also significantly reduced all-cause mortality (RR: 0.82; 95% CI: 0.67 to 0.99; p = 0.04) and cardiovascular death (RR: 0.68; 95% CI: 0.49 to 0.94; p = 0.02). The incidence of myocardial infarction, stent thrombosis, and stroke were similar between the groups. Net adverse clinical events (NACE) were 27% lower with ticagrelor monotherapy (RR: 0.73; 95% CI: 0.63 to 0.85; p <0.0001). In conclusion, ticagrelor monotherapy after short-duration DAPT reduces major bleeding complications without compromising cardiovascular protection. This approach offers a promising strategy to optimize outcomes for PCI patients, particularly those at high bleeding risk. Further studies are needed to refine the optimal DAPT duration in various patient populations, especially those with higher ischemic risk.

Dual antiplatelet therapy (DAPT), consisting of aspirin and an oral P2Y12 inhibitor (clopidogrel, prasugrel, or ticagrelor), is the standard treatment for patients undergoing percutaneous coronary intervention (PCI) with drug-eluting stents (DES). However, the optimal duration of DAPT has been debated for years, with guidelines recommending six to twelve months for patients at low bleeding risk.[1,2] While extended DAPT reduces ischemic events like stent thrombosis, it also increases the risk of major bleeding.

The development of less thrombogenic stent platforms[3] and the recognition of the prognostic impact of bleeding complications in patients undergoing PCI[4] have driven interest in optimizing antiplatelet strategies. A key focus has been on approaches that minimize bleeding risk without increasing ischemic events. Among these, the early discontinuation of DAPT —by stopping either aspirin or a P2Y12 inhibitor within 1 to 6 months after PCI or acute coronary syndrome (ACS)— has emerged as a straightforward and promising strategy.

Ticagrelor, a potent P2Y12 inhibitor, has become a key agent in antiplatelet therapy. Modern randomized controlled trials (RCTs) have investigated whether transitioning from short-duration DAPT to ticagrelor monotherapy can reduce bleeding complications without compromising efficacy in preventing major adverse cardiovascular events (MACCE).

This systematic review and meta-analysis aimed to evaluate the efficacy and safety of ticagrelor monotherapy after short-duration DAPT compared to extended DAPT, focusing on key outcomes such as major bleeding, MACCE, all-cause mortality, cardiovascular death, myocardial infarction, stent thrombosis, and stroke.

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Methods

Search strategy

We conducted this systematic review and meta-analysis in accordance with PRISMA guidelines.[5] A comprehensive search was performed (Supplementary figure 1) to identify RCTs comparing ticagrelor monotherapy after short-duration DAPT (1 to 3 months) to extended DAPT in patients undergoing PCI with DES. Studies published up December 31, 2024 were included using the following keywords: "ticagrelor," "dual antiplatelet therapy," "monotherapy," "DAPT," "PCI," "DES," "bleeding," "myocardial infarction," and "cardiovascular outcomes."

Study selection

Two independent reviewers selected studies based on the following criteria:

1. Patients undergoing PCI with DES,
2. Randomized comparison of ticagrelor monotherapy after short-duration ticagrelor-based DAPT to extended DAPT,
3. Reporting 1-year outcomes such as major bleeding, MACCE, all-cause mortality, cardiovascular death, myocardial infarction, stent thrombosis, and stroke.

Data related to the outcomes of interest, along with key clinical and procedural characteristics, were systematically extracted from each study and compiled into dedicated electronic spreadsheets. Data extraction was done independently by two reviewers, and discrepancies were resolved by consensus or by a third reviewer. A comprehensive summary was created for the trial-level data, which included essential details such as study design features, follow-up duration, and the definitions of primary endpoints. This thorough approach ensured that all relevant information was captured and organized for further analysis.

Endpoints

The primary efficacy endpoint in this analysis was MACCE, as defined by the individual protocols of each included study. This composite endpoint typically encompassed all-cause mortality, cardiovascular death, stroke, myocardial infarction (MI), stent thrombosis, and, in some cases, target-vessel revascularization, depending on the specific study design. The primary safety endpoint was major bleeding, which was assessed using either the Bleeding Academic Research Consortium (BARC) definitions or the Thrombolysis in Myocardial Infarction (TIMI) scale. In cases where the BARC definitions were not applied, the TIMI definitions were used as a reliable proxy. This substitution was made because the two bleeding scales are closely aligned and offer similar grading for bleeding severity, enabling meaningful comparisons across studies. Specifically, TIMI minor bleeding is generally equivalent to BARC 3a bleeding, which indicates mild but clinically significant bleeding. Conversely, TIMI major bleeding typically corresponds to BARC 3b, 3c, and 5, which describe more severe bleeding events, including those that necessitate medical intervention or result in serious complications. By using the TIMI definitions in place of BARC, we ensured a consistent and reliable method for evaluating bleeding complications, even when BARC criteria were unavailable. Secondary outcomes included the individual components of MACCE—such as all-cause mortality, cardiovascular death, myocardial infarction, stent thrombosis, and stroke—providing a detailed assessment of cardiovascular outcomes. The key secondary endpoint was Net Adverse Clinical Events (NACE), defined as the composite of major bleeding and MACCE. When not directly reported in the studies, NACE was calculated to ensure a consistent evaluation of the overall clinical benefit-risk balance across the trials.

Statistical analysis

A DerSimonian and Laird random-effects meta-analysis was conducted with the estimate of heterogeneity taken from the Mantel–Haenszel model, with pooled risk ratios (RRs) and 95% confidence intervals (CIs) calculated. The Cochrane Risk of Bias tool was used to assess the quality of RCTs. Heterogeneity was quantified using the Higgins I squared (I^2) statistic with I^2 <25%, 25% to 50%, and I^2 >50% representing mild, moderate, and severe heterogeneities. Publication bias was assessed using funnel plots and further explored with Egger's regression asymmetry test, and statistical significance was set at $p < 0.05$. All statistical analyses were performed using R version 4.4.1.

Results

Study characteristics

Five randomized controlled trials (RCTs) met the inclusion criteria (Table 1), encompassing a total of 32,393 patients, 66% of whom presented with acute coronary syndrome (ACS). All patients underwent percutaneous coronary intervention (PCI) with drug-eluting stents (DES). Among them, 16,188 received ticagrelor monotherapy following a short-duration dual antiplatelet therapy (DAPT) regimen of less than 1 to 3 months, while 16,205 received prolonged DAPT (≥12 months). The duration of DAPT before randomization and the timing of randomization varied across the studies, ranging from immediately after the index procedure to 3 months following an event-free period. The T-PASS[6] study had a DAPT duration of less than one month, while the GLOBAL-LEADERS[7] and ULTIMATE-DAPT[8] studies used one month. In contrast, the TICO[9] and TWILIGHT[10] studies implemented a three-month duration. Notably, the TWILIGHT[10] study excluded patients with ST segment Elevation Myocardial Infarction (STEMI) as clinical presentation. Follow-up ranged from 12 to 24 months, but our analysis was based on 12-month follow-up data to maintain consistency with the GLOBAL-LEADERS protocol.[7] Importantly, in the GLOBAL-LEADERS trial all study endpoints, apart from Q-wave myocardial infarction (MI), were analyzed based on investigator-reported data. To this purpose, the GLOBAL-LEADERS Adjudication Sub-Study (GLASSY) adopted a more rigorous methodology, involving an independent clinical event committee to adjudicate both investigator-reported and potentially unreported events. This process, which encompassed 7,585 patients from the 20 highest-enrolling sites, ensured greater objectivity and accuracy in event classification.

Primary endpoints

Ticagrelor monotherapy after short-duration DAPT was associated with a 12% significant reduction in MACCE compared to extended DAPT (RR: 0.88; 95% CI: 0.77 to 0.99; p = 0.04). This consistent finding across the trials included in the meta-analysis suggests that ticagrelor monotherapy provides at least comparable, if not superior, cardiovascular protection while enabling a shorter DAPT duration (Figure 1, Supplementary figure 2). The risk of major bleeding was significantly lower in the ticagrelor monotherapy group compared to extended DAPT (RR: 0.53; 95% CI: 0.37 to 0.77; p = 0.0008). This reduction was observed across different bleeding definitions (BARC type 3 or 5, TIMI major bleeding), reinforcing the benefit of a shorter DAPT strategy (Figure 1, Supplementary figure 2).

Table 1
Design and main findings of studies included in the systematic review

Trial	Study population	Patients' characteristics	Patients with ACS	ACS presentation	Mean Age	Female (%)	Diabetes (%)	Trial Design	Blinding	Randomization Time	Short DAPT Duration	Standard DAPT Definition	Primary Endpoint Findings
GLOBAL LEADERS (2019)	15,968	All-comer patients post-PCI	7,487 (47%)	STEMI: 28%, NSTE-ACS: 72%	64	23%	25%	Superiority	Open label	In hospital	1 month	12-month ticagrelor-based DAPT	Ticagrelor monotherapy after 1 month of DAPT did not significantly reduce all-cause mortality or new Q-wave MI compared to standard DAPT.
GLASSY (2019)	7,585	Sub-study of GLOBAL-LEADERS based on an independent clinical event committee adjudicating events from the 20 top-enrolling participating sites	3,840 (51%)	STEMI: 35%, NSTE-ACS: 65%	65	24%	24%	Noninferiority and, if met, superiority	Open label	In hospital	1 month	12-month ticagrelor-based DAPT	Ticagrelor monotherapy after 1-month DAPT was noninferior, but not superior, to conventional DAPT in the prevention of ischemic events and it did not decrease the risk of major bleeding.
TWILIGHT- (2019)	7,119	High-risk patients post-PCI	4,614 (65%)	NSTE-ACS: 100%	65	24%	36%	Noninferiority	Double blind	Within 3 months after index procedure	3 months	15-month ticagrelor-based DAPT)	Ticagrelor monotherapy after 3 months of DAPT reduced bleeding without increasing ischemic events compared to continued DAPT.
TICO (2020)	3,056	ACS patients post-PCI	3,056 (100%)	STEMI: 36%, NSTE-ACS: 64%	61	21%	27%	Noninferiority	Open label	In hospital	3 months	12-month ticagrelor-based DAPT	Ticagrelor monotherapy after 3 months of DAPT reduced net adverse clinical events compared to 12-month DAPT.
T-PASS (2023)	2,850	ACS patients post-PCI	2,850 (100%)	STEMI: 40%, NSTE-ACS: 60%	61	17%	30%	Noninferiority	Open label	After index procedure	<1 month (16 days)	12-month ticagrelor-based DAPT	Ticagrelor monotherapy after less than 1 month of DAPT was superior in reducing bleeding events without increasing ischemic risk compared to 12-month DAPT.
ULTIMATE-DAPT (2024)	3,400	ACS patients post-PCI	3,400 (100%)	STEMI: 28%, NSTE-ACS: 72%	63	26%	32%	Noninferiority	Double blind	1 month	1 month	12-month ticagrelor-based DAPT	Ticagrelor monotherapy after 1 month of DAPT reduced bleeding and provided comparable ischemic outcomes compared to 12-month DAPT.

Secondary Endpoints (Figure 1, Supplementary figures 2 to 3)

1. All-Cause Mortality

Ticagrelor monotherapy significantly reduced all-cause mortality by 18% compared to extended DAPT (RR: 0.82; 95% CI: 0.67 to 0.99; p = 0.04).

2. Cardiovascular Death

A significant 32% reduction in cardiovascular death was observed with ticagrelor monotherapy, using adjudicated data from GLASSY (RR: 0.68; 95% CI: 0.49 to 0.94; p = 0.02).

3. Myocardial Infarction

The incidence of myocardial infarction was comparable between ticagrelor monotherapy and extended DAPT (RR: 1.08; 95% CI: 0.92 to 1.26; p = 0.37), indicating that shortening DAPT did not increase the risk of myocardial infarction.

4. Stent Thrombosis

There was no significant difference in stent thrombosis rates between the two groups (RR: 1.13; 95% CI: 0.82 to 1.56; p = 0.46).

5. Stroke

The risk of ischemic stroke was similar between ticagrelor monotherapy and extended DAPT (RR: 0.95; 95% CI: 0.67 to 1.36; p = 0.80).

6. NACE, Key Secondary Endpoint

The risk of NACE was 27% significantly lower with ticagrelor monotherapy as compared with extended DAPT (RR: 0.73; 95% CI: 0.63 to 0.85; p <0.0001).

Heterogeneity and potential publication bias

Heterogeneity was low for the primary outcome, MACCE (I^2 = 0%), as well as for other outcomes like all-cause mortality, cardiovascular death, and myocardial infarction, indicating that the results were consistent across studies. In contrast, heterogeneity was higher for NACE (I^2 = 49%) and major bleeding (I^2 = 71%), which could be attributed to differences in patient populations, bleeding risk, and variations in bleeding definitions (such as BARC vs. TIMI criteria) across the included trials. This variability suggests that caution is needed when interpreting the magnitude of the bleeding risk reduction, even though the overall effect remains significant.

The results of the funnel plot asymmetry (Supplementary figures 4 to 5) tests indicated no significant bias for MACCE (p = 0.7566). However, significant publication bias was detected for major bleeding (p = 0.0213) and NACE (p = 0.0049), For other secondary outcomes, no significant funnel plot asymmetry was observed.

Risk of bias

The risk of bias analysis (Supplementary figure 6) showed that TICO, TWILIGHT, T-PASS, and ULTIMATE-DAPT had consistently low risk of bias, reflecting robust study designs and reliable outcomes. Conversely, GLOBAL-LEADERS, with its open-label design and lack of blinding, introduced potential bias, particularly in subjective outcomes. However, GLASSY, a sub-study of GLOBAL-LEADERS, mitigated some limitations through stricter adjudication processes,

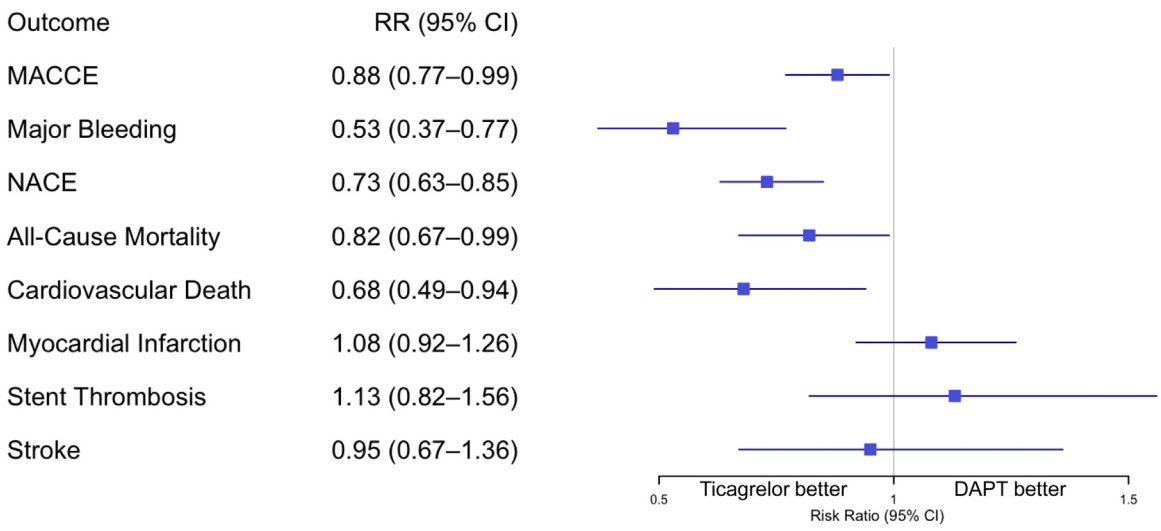

Figure 1. The Forest Plot presents pooled estimates comparing ticagrelor monotherapy and DAPT across various endpoints of the meta-analysis.

providing valuable contributions to the evidence base despite inheriting some biases from the parent trial.

Discussion

This meta-analysis provides compelling evidence that ticagrelor monotherapy after a short-duration DAPT regimen significantly reduces the risk of major bleeding complications without compromising the efficacy of preventing ischemic events such as myocardial infarction, stroke, and stent thrombosis. These findings have critical implications for optimizing long-term outcomes in patients undergoing percutaneous coronary intervention (PCI), particularly by addressing the challenge of balancing bleeding risk with ischemic protection. By significantly reducing the incidence of major bleeding[4,11]—a well-established contributor to both morbidity and mortality in PCI patients—ticagrelor monotherapy offers a promising strategy to improve the safety and effectiveness of antiplatelet therapy in high-risk cardiovascular populations.

Efficacy of ticagrelor monotherapy on mortality

An important finding of this meta-analysis is the significant reduction in all-cause mortality (RR: 0.82; 95% CI: 0.67 to 0.99; p = 0.04) and cardiovascular mortality (RR: 0.68; 95% CI: 0.49 to 0.94; p = 0.02) with ticagrelor monotherapy compared to extended DAPT. These results highlight that shortening DAPT duration not only maintains survival rates but may also provide a mortality benefit. The observed reduction in MACCE in the ticagrelor monotherapy group further underscores the potential of a shorter DAPT duration to maintain cardiovascular protection. Notably, the reduction in MACCE appears to be primarily driven by a decrease in fatal bleeding events, rather than differences in ischemic outcomes. In fact, pure ischemic endpoints—such as myocardial infarction, stent thrombosis, and ischemic stroke—did not show significant differences between the two groups. This finding is significant because ischemic events have traditionally driven the preference for prolonged DAPT in high-risk patients, emphasizing the need for long-term protection against thrombotic events. The fact that ticagrelor monotherapy does not result in a higher incidence of ischemic events, while simultaneously reducing major bleeding risks, suggests a better balance between safety and efficacy, leading to an overall improvement in survival.

The most plausible explanation for the observed mortality reduction is the lower risk of major bleeding with ticagrelor monotherapy. Major bleeding complications are a well-known cause of death in patients on long-term antiplatelet therapy, particularly in the context of PCI. By reducing the duration of DAPT, ticagrelor monotherapy decreases patients' exposure to prolonged antiplatelet therapy and the associated bleeding risk. This reduction in bleeding risk may, in turn, contribute to fewer fatalities related to hemorrhagic events, resulting in an overall mortality benefit. Although the precise mechanisms behind this benefit are not fully elucidated, the reduction in bleeding is a reasonable hypothesis that merits further investigation.

Bleeding outcomes

The significant reduction in major bleeding observed with ticagrelor monotherapy is the key finding of this analysis. Major bleeding is a well-established predictor of poor outcomes in patients undergoing PCI[4] and remains a major challenge in the management of high-risk cardiovascular patients. Bleeding complications not only contribute to direct mortality but also increase the risk of long-term disability, recurrent hospitalization, and reduced quality of life. Therefore, minimizing bleeding risk is a critical factor in optimizing clinical outcomes and improving patient survival.[4,11] The reduction in major bleeding with ticagrelor monotherapy was consistent across different definitions of bleeding, including the BARC and TIMI bleeding scales, which further strengthens the reliability of this finding. Despite some heterogeneity in bleeding outcomes across the included trials—likely due to differences in baseline bleeding risks, trial designs, and populations—the consistency of the benefit across multiple studies suggests that this is a robust and reliable effect. It supports the notion that shorter DAPT duration, coupled with ticagrelor monotherapy, is a safer alternative that significantly reduces bleeding complications without compromising ischemic protection.

Implications for clinical practice

These findings are particularly relevant in the context of personalized antiplatelet therapy. Growing awareness of the prognostic impact of bleeding in PCI patients have spurred interest in antiplatelet strategies that reduce bleeding without increasing ischemic risks.[11] Among these, early discontinuation of DAPT—by stopping aspirin or a P2Y12 inhibitor within 1 to 6 months after PCI or ACS—has gained attention as a practical and promising approach.[12,13]

However, the discontinuation of either aspirin or the P2Y12 inhibitor six months after acute coronary syndrome (ACS) has shown

mixed outcomes. While bleeding risk was reduced, P2Y12 discontinuation was associated with an increased risk of myocardial infarction (MI) (1.8% vs. 0.8%; HR 2.41, 95% CI 1.15 to 5.05) and stent thrombosis (ST) (1.1% vs. 0.7%; HR 1.5, 95% CI 0.68 to 3.35) compared to standard 12-month dual antiplatelet therapy (DAPT) in SMART-DATE, the largest randomized controlled trial (RCT) on the topic (n = 2,712).[14]

Similarly, a strategy of short DAPT followed by aspirin discontinuation and clopidogrel monotherapy after 1 to 2 months (median of 39 days) failed to demonstrate noninferiority to the standard 12-month DAPT in terms of net adverse clinical events (NACEs). Clopidogrel monotherapy was indeed linked to an increased risk of MI (1.6% vs. 0.9%; HR 1.91, 95% CI 1.06 to 3.44) and a numerically higher risk of ST (0.5% vs. 0.2%; HR 2.54, 95% CI 0.80 to 8.10) in STOPDAPT2-ACS, the largest RCT investigating this strategy (n = 4,169), although bleeding rates were reduced.[15]

A network meta-analysis comparing P2Y12 inhibitors to aspirin after post-PCI DAPT however suggested that P2Y12 inhibitors have the potential to reduce the risk of MI without increasing bleeding risks. Although the number needed to treat (NNT) to prevent one MI was relatively high, the findings supported using P2Y12 inhibitors over aspirin for monotherapy after DAPT.[16]

Ticagrelor, a powerful P2Y12 inhibitor, plays a critical role in antiplatelet therapy, particularly in the prevention of thrombotic events in patients undergoing PCI. It has shown superior efficacy compared to clopidogrel,[17] reducing the risk of major cardiovascular events, while offering a favorable safety profile in terms of bleeding risk.

Recent RCTs exploring whether transitioning to ticagrelor, rather than clopidogrel, monotherapy after a short course of DAPT (1 to 3 months) in patients with ACS can effectively reduce bleeding while maintaining protection against major adverse cardiovascular events (MACE) yielded favorable outcomes.[6,8] However, concerns about potential ischemic risks remain, given that these studies were not powered for hard ischemic endpoints. The present and other meta-analyses,[18,19] which pool data across studies, may provide a sufficient answer to these concerns, potentially obviating the need for further studies. Importantly, while ticagrelor monotherapy reduced bleeding without increasing major adverse cardiovascular events compared to standard 12-month DAPT with ticagrelor,[19] pooled data demonstrate that clopidogrel monotherapy was not noninferior to standard 12-month DAPT with clopidogrel.[18] Notably, no RCTs are available on prasugrel monotherapy following a short DAPT course. The differences in outcomes between clopidogrel and ticagrelor monotherapy are consistent with findings from studies involving 12-month DAPT.[17] They likely reflect the pharmacodynamic disparities between these agents. High residual platelet reactivity occurs in nearly 30% of clopidogrel-treated patients but in less than 5% of those treated with ticagrelor, which may explain their differing clinical effects.[20]

Patients with a higher risk of bleeding[21] or those with stable ischemic heart disease[10] may particularly benefit from transitioning to ticagrelor monotherapy after a shorter course of DAPT. This approach could help strike the right balance between minimizing ischemic complications and avoiding unnecessary bleeding risks.

Ticagrelor is associated with respiratory side effects, particularly dyspnea, which affects more than 10% of patients.[22] While dyspnea is generally mild and transient, its persistence can lead to discomfort and may prompt consideration of drug discontinuation. The therapeutic benefit of ticagrelor monotherapy in preventing ischemic events must be carefully weighed against the potential discomfort caused by dyspnea. In such cases, ticagrelor disruption[23] potentially leads to worse patient outcomes. Therefore, while ticagrelor-induced dyspnea may be distressing, it is critical for clinicians to evaluate the severity of symptoms before deciding to discontinue therapy and considering alternative strategies.[12,13,16] Only in cases of persistent, intolerable dyspnea, where no suitable adjustments can be made, should discontinuation be considered. In such cases, alternative antiplatelet therapies should be promptly initiated to minimize the risk of thrombotic events and ensure continued patient safety.[12,13,16]

Study limitations

While the findings of this study highlight the potential benefits of ticagrelor monotherapy following a short course of DAPT, several important limitations should be acknowledged. These include variability in DAPT duration across studies before ticagrelor monotherapy and the use of different outcome definitions for MACCE and bleeding complications, which could introduce bias. Indeed, while heterogeneity was low for most outcomes, the variability in bleeding risk requires further exploration, particularly in subgroups with different baseline bleeding risks. Also, significant publication bias was identified for major bleeding and NACE. This suggests that the data for these outcomes may not be entirely representative of all available evidence. Possible reasons include selective reporting of favorable results and overrepresentation of studies showing a strong effect. These factors can skew the meta-analysis results, potentially exaggerating or underestimating the true effect size for these adverse events. Overall, while ticagrelor monotherapy demonstrates consistent benefits in reducing major cardiovascular events, caution should be exercised in interpreting the reduction in bleeding events due to potential publication bias and the observed heterogeneity in the bleeding outcomes. Notably, three of the studies primarily focused on East Asian populations,[6,8,9] which have different ischemic and bleeding event rates compared to Western populations.[24] The limited representation of female patients and those with STEMI in the studies also restricts the applicability of the findings to these populations. As expected, the absence of patient-level data significantly impedes the ability to draw precise conclusions about individual outcomes and subgroup-specific effects. This lack of granular data makes it challenging to evaluate how variables such as comorbidities, age, gender and ethnicity might impact the safety and efficacy of ticagrelor monotherapy compared to standard DAPT. These limitations emphasize the necessity for further research to better understand bleeding risks across diverse subgroups and to optimize strategies for DAPT duration and the transition to monotherapy.

Conclusions

This meta-analysis demonstrates that ticagrelor monotherapy after short-duration DAPT is not only effective in reducing bleeding complications but also provides comparable ischemic protection to extended DAPT. Furthermore, the observed reduction in all-cause mortality underscores the potential of this strategy to improve patient survival by addressing the significant burden of bleeding complications. By offering a more balanced approach to antiplatelet therapy, ticagrelor monotherapy represents a promising treatment option that could optimize outcomes for patients undergoing PCI, particularly in those at high risk for bleeding. Further studies are warranted to refine the optimal duration of DAPT for different patient populations, especially those at higher ischemic risk.

Ethical Approval

As the present study comprises secondary publications utilizing published trials as source material, we were exempt from the requirement to obtain ethical approval.

Data availability statement

The data will be shared on reasonable request to the corresponding author.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Giulia Alagna: Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **Giancarlo Trimarchi:** Writing – review & editing, Validation, Supervision, Methodology. **Alessia Cascone:** Writing – review & editing, Methodology, Formal analysis, Data curation. **Alessio Villari:** Writing – review & editing, Validation, Software, Investigation. **Giulia Cavolina:** Writing – review & editing, Supervision, Software, Investigation. **Francesca Campanella:** Writing – review & editing, Software, Methodology, Formal analysis. **Antonino Micari:** Software, Investigation, Formal analysis. **Giovanni Taverna:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Giuseppe Andò:** Writing – review & editing, Validation, Supervision, Project administration, Methodology, Conceptualization.

Supplementary materials

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.amjcard.2025.01.014.

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