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Systematic Review/Meta-analysis

Pharmaco-Invasive Strategy Vs Primary Percutaneous Coronary Intervention for ST-Segment Elevation Myocardial Infarction in Latin America: A Meta-Analysis

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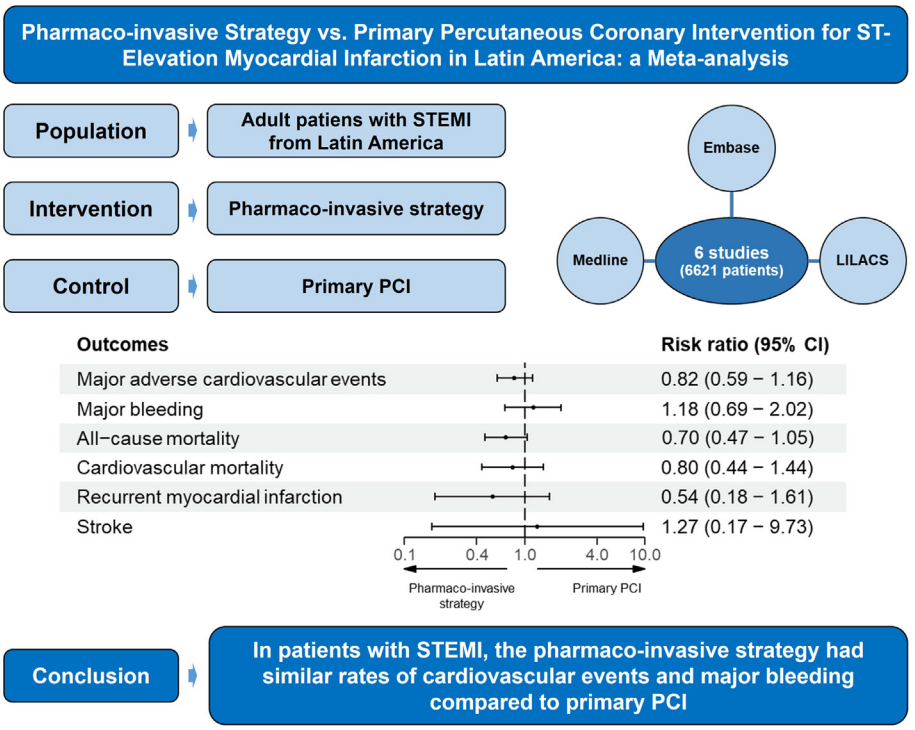

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ABSTRACT

Background: Primary percutaneous coronary intervention (PCI) is the established treatment for ST-segment elevation myocardial infarction (STEMI), but often it is not readily available in low-resource settings. We assessed the safety and efficacy of the pharmaco-invasive strategy compared to primary PCI for STEMI in Latin America.

Methods: MEDLINE, Embase, and Latin American and Caribbean Health Sciences Literature (LILACS) were searched for the period from their inception to September 2023, for studies that compared a pharmaco-invasive strategy vs primary PCI in Latin America. Primary outcomes were major adverse cardiovascular events and bleeding. Secondary outcomes were all-cause mortality, cardiovascular mortality, recurrent myocardial infarction, and stroke. Risk of bias was assessed using the Risk Of Bias In Non-randomized Studies—of Interventions (ROBINS-I) tool. Risk ratios (RRs) and 95% confidence intervals (CIs) from random-effects meta-analyses were reported.

Results: Six cohort studies (n = 6621) were included; no clinical trials were found. The follow-up duration ranged from the in-hospital period to 1 year. Patients who underwent a pharmaco-invasive strategy (n = 841) vs a primary PCI (n = 5780) had similar rates of major adverse cardiovascular events (RR 0.82; 95% CI 0.59-1.16), major bleeding (RR 1.18; 95% CI 0.69-2.02), all-cause mortality (RR 0.70; 95% CI 0.47-1.05), cardiovascular mortality (RR 0.80; 95% CI 0.44-1.44), recurrent myocardial infarction (RR 0.54; 95% CI 0.18-1.61), and stroke (RR 1.27; 95% CI 0.17-9.73). Most studies had a serious (33%) or critical (50%) risk of bias.

Conclusions: Among patients with STEMI in Latin America, only low-quality observational evidence indicated that cardiovascular outcomes and major bleeding rates were similar for those treated with a pharmaco-invasive strategy vs primary PCI. Randomized studies are needed in Latin America with the development of STEMI networks for better care.

RÉSUMÉ

Contexte : L'intervention coronarienne percutanée (ICP) primaire est le traitement établi de l'infarctus du myocarde avec élévation du segment ST (STEMI), mais souvent, elle n'est pas facilement accessible dans les régions à faibles ressources. Nous avons évalué la sécurité et l'efficacité de la stratégie pharmaco-invasive par rapport à l'ICP primaire pour un STEMI en Amérique latine.

Méthodes : MEDLINE, Embase et LILACS (base de données bibliographiques des littératures scientifique et technique de l'Amérique latine et des Caraïbes) ont été consultés pour la période allant de la date de leur création jusqu'à septembre 2023, afin de trouver des études comparant une stratégie pharmaco-invasive à une ICP primaire, en Amérique latine. Les principaux critères d'évaluation étaient les événements cardiovasculaires indésirables majeurs (ECIM) et les saignements. Les critères d'évaluation secondaires étaient la mortalité toutes causes confondues, la mortalité cardiovasculaire, la récidive d'infarctus du myocarde et les accidents vasculaires cérébraux (AVC). Le risque de biais a été évalué à l'aide de l'outil ROBINS-I (Risk Of Bias In Non-randomized Studies-of Interventions). Les rapports de risque (RR) et les intervalles de confiance (IC) à 95 % des méta-analyses basées sur un modèle à effets aléatoires ont été rapportés.

Résultats : Six études de cohorte (n = 6 621) ont été incluses; aucun essai clinique n'a été trouvé. La durée du suivi variait, de la durée de la période hospitalière à 1 an. Les patients ayant subi une stratégie pharmaco-invasive (n = 841) par rapport à une ICP primaire (n = 5 780) présentaient des taux similaires d'ECIM (RR 0,82; IC à 95 % 0,59-1,16), d'hémorragies majeures (RR 1,18; IC à 95 % 0,69-2,02), de mortalité toutes causes confondues (RR 0,70; IC à 95 % 0,47-1,05), de mortalité cardiovasculaire (RR 0,80; IC à 95 % 0,44-1,44), d'infarctus du myocarde récurrent (RR 0,54; IC à 95 % 0,18-1,61) et d'AVC (RR 1,27; IC à 95 % 0,17-9,73). La plupart des études présentaient un risque de biais grave (33 %) ou critique (50 %).

Conclusions : Chez les patients victimes d'un STEMI en Amérique latine, seules des données d'observation de faible qualité indiquaient que les résultats cardiovasculaires et les taux d'hémorragies majeures étaient similaires chez les patients traités par une stratégie pharmaco-invasive par rapport à l'ICP primaire. En Amérique latine, des études randomisées doivent être menées en parallèle du développement de réseaux STEMI pour une meilleure prise en charge.

The burden of ST-segment elevation myocardial infarction (STEMI) is increasing in low- and middle-income countries. A recent multinational registry from Latin America reported that 48% of acute coronary syndromes were STEMI.[1] Emergent reperfusion via primary percutaneous coronary intervention (PCI) is the standard-of-care for the management of STEMI for patients within 12 hours of symptom onset, but often, it is not readily available in low-resource settings, due to either limited geographic spread of primary PCI capacity or financial limitations.[2] In this context, an alternative approach is the pharmaco-invasive strategy, in which fibrinolytics are started in prehospital settings or in non-PCI-capable hospitals, followed by early PCI.[2]

Latin America faces multiple factors that limit access to primary PCI for patients with STEMI, including structural disparities in prehospital emergency medical services, geographic and logistical differences, and hospitals that are not able to perform PCI.[3] As a result of these factors, achievement of the goal recommended by current clinical guidelines, of performing primary PCI within 90 minutes of first medical contact at PCI-capable hospitals and within 120 minutes at non-PCI-capable hospitals, is unlikely.[2] Therefore, the pharmaco-invasive strategy could be the main reperfusion strategy in Latin American countries until resources allow for the greater development of primary PCI.

Although a few randomized controlled trials show that the risk of mortality is similar with the pharmaco-invasive strategy to that with primary PCI[4]; these studies were conducted in

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See page 86 for disclosure information.

developed countries with a health system organization and hospital access that cannot be extrapolated to resource-constrained settings. Therefore, we conducted a systematic review and meta-analysis to assess the efficacy and safety of the pharmaco-invasive strategy compared to primary PCI in patients with STEMI from Latin America.

Methods

This systematic review was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) 2020 statement.[5] The study protocol was registered in the International Prospective Register for Reporting Systematic Reviews (PROSPERO) repository (No. CRD42023467746).

Literature search and study selection

Search strategy. We searched MEDLINE via PubMed, Embase, and Latin American and Caribbean Health Sciences Literature (LILACS) for the period from their inception to September 10, 2023. The search strategy is shown in Supplemental Table S1. No language restriction was considered. In addition, we hand-searched reference lists of included studies and systematic reviews.

Eligibility criteria. We aimed to include studies conducted in Latin America, either randomized controlled trials or cohort studies, that included patients aged $\geq$ 18 years diagnosed with STEMI, and we compared outcomes between those who received a pharmaco-invasive strategy vs primary PCI. In the pharmaco-invasive strategy, patients initially underwent fibrinolysis, followed by PCI, either routinely or as rescue; in the primary PCI group, patients initially underwent PCI. Primary outcomes of interest included the incidence of major adverse cardiovascular events (MACE) and major bleeding, whereas secondary outcomes included all-cause mortality, cardiovascular mortality, recurrent myocardial infarction, and stroke. Outcomes were defined as reported by primary studies (Supplemental Table S2).

Study selection. All data records were downloaded to EndNote 20 (Clarivate Analytics, Philadelphia, PA), and duplicates were removed; records were subsequently uploaded to the Rayyan website (https://rayyan.ai/); 2 reviewers independently accessed the records there and performed the study selection. Titles and abstracts were screened using the above eligibility criteria, and then, potentially eligible studies were finally included after full-text review. Disagreements were resolved by consensus.

Data extraction

Two reviewers independently extracted data using a standardized form. Variables of interest included the following: the year of publication, study design, country, study period, sample size, eligibility criteria, length of follow-up, definition of pharmaco-invasive strategy and primary PCI, age, sex, comorbidities, Killip class, door-to-balloon time, and definition and data on primary and secondary outcomes.

Risk-of-bias assessment

Two reviewers independently assessed the risk of bias for cohort studies using the Risk Of Bias In Non-randomized Studies—of Interventions (ROBINS-I) tool.[6] Disagreements were resolved by consensus. The ROBINS-I tool assesses the risk of bias in 7 domains (confounding, participant selection, classification of interventions, deviations from intended interventions, missing data, measurement of outcomes, and selection of the reported result). Each domain was classified as having either a low, moderate, or serious risk of bias, or no information.

Statistical analysis

All meta-analyses were conducted using a random-effects model. The between-study variance was estimated using the Paule-Mandel estimator. Crude relative risks (RRs) with their 95% confidence intervals (CIs) that compared pharmaco-invasive strategy vs primary PCI (reference group) were pooled for all outcomes. In case RRs were not provided by the studies, we calculated them from reported data. Given that the adjusted effect estimates were not consistently reported across studies, in addition to using a heterogeneous set of adjustment variables, we performed only a narrative synthesis of these. Heterogeneity of studies was assessed with the Cochran's Q test and the I^2 statistic; an $I^2 \geq 50\%$ may indicate substantial heterogeneity. We did not perform publication bias assessment because each outcome did not have a minimum of 10 studies. We used the package *'meta'* from R 4.3.1 software (www.r-project.org) to conduct all meta-analyses, considering a 2-tailed $P < 0.05$ to be statistically significant.

Results

Study selection

Per our study flowchart, 6 studies were included in our meta-analysis,[7-12] through either a literature search (n = 2) or a hand search (n = 4; Supplemental Fig. S1). The literature search yielded 1134 records for initial screening and 20 records for subsequent full-text review; 18 of these studies were excluded because they lacked a comparison group (n = 10) or were either a conference abstract (n = 4), an editorial (n = 2), a review (n = 1), or a protocol (n = 1).

Study characteristics

Characteristics of the 6 included studies are shown in Table 1. All were cohort studies, either prospective (n = 2 of 6)[8,11] or retrospective (n = 4 of 6),[7,9,10,12] conducted between 2016 and 2022; no randomized controlled trials were found. These studies were conducted in Mexico (n = 2),[8,12] Peru (n = 2),[7,9] Argentina (n = 1),[11] and Chile (n = 1; Fig. 1).[10] A total of 6621 patients were included; their mean age ranged from 45.5 to 61 years, and 19% were female. The duration of the patient follow-up period ranged from the in-hospital time to 1 year. The most common comorbidities were hypertension (52%), diabetes (31%), and dyslipidemia (28%). Most patients (76%) were in Killip class I on admission. Regarding reperfusion times, the studies reported a range of median ischemic times from 190 to 420 minutes, and a door-to-needle or door-to-balloon time ranging from 39 to 98

Table 1. Characteristics of included studies

Study	Country	Length of follow-up period	Groups	Sample size	Thrombolytic agent	Age, y*	Female, %	Comorbidities	Time to reperfusion (needle to balloon), min*	Total ischemic time, min*	Outcomes
Sierra-Fragoso et al.[12] (2018)	Mexico	In-hospital	PIS	137	—	—	22	Hypertension (51%), diabetes (48%), dyslipidemia (28%), smoking (60%)	39 ± 22	358 ± 221	MACE, major bleeding, all-cause mortality, recurrent MI, stroke
			pPCI	263	—	—	22	Hypertension (58%), diabetes (46%), dyslipidemia (28%), smoking (55%)	39 ± 21	309 ± 189	
Rossi et al.[11] (2023)	Argentina	In-hospital	PIS	143	—	58 ± 11	27	Hypertension (52%), diabetes (20%), dyslipidemia (33%), smoking (66%), previous MI (10%), previous PCI (33%), previous CABG (0%)	45 (30−90)	191 (100−330)	Major bleeding, all-cause mortality
			pPCI	4240	—	61 ± 12	35	Hypertension (58%), diabetes (23%), dyslipidemia (44%), smoking (42%), previous MI (11%), previous PCI (29%), previous CABG (1.2%)	98 (53−180)	280 (179−520)	
Hameau et al.[10] (2022)	Chile	30 d	PIS	144	Tenecteplase	45.5 ± 27.8	13	Hypertension (57.5%), diabetes (25.6%), dyslipidemia (9.7%), smoking (29.8%), previous MI (4.8%), CKD (0%), COPD (0%)	—	—	Major bleeding, all-cause mortality
			pPCI	794	—	48.5 ± 28.1	23	Hypertension (66.3%), diabetes (30.3%), dyslipidemia (7.8%), smoking (25%), previous MI (6.8%), CKD (3.2%), COPD (1.3%)	—	—	
Chacón-Diaz et al.[9] (2022)	Peru	In-hospital and 30 d	PIS	96	Alteplase (full dose)	62 (52−70)	13	Hypertension (44%), diabetes (27%), dyslipidemia (44%), smoking (22%), previous MI (4%), CKD (5%)	90 (50−150)†	240 (127−330)	MACE, major bleeding, all-cause mortality, CV mortality, stroke
			pPCI	76	—	68 (59−75)	8	Hypertension (49%), diabetes (18%), dyslipidemia (49%), smoking (37%), previous MI (4%), CKD (7%)	287 (160−420)†	430 (300−600)	

Continued

Table 1. Continued.

Study	Country	Length of follow-up period	Groups	Sample size	Thrombolytic agent	Age, y*	Female, %	Comorbidities	Time to reperfusion (needle to balloon), min*	Total ischemic time, min*	Outcomes
Araiza -Garaygordobil et al.[8] (2021)	Mexico	30 d	PIS	288	Tenecteplase, alteplase, and streptokinase	57.3 ± 10.9	13.1	Hypertension (43%), diabetes (41%), dyslipidemia (17%), smoking (47%), previous MI (7%), CKD (2%)	40 (10−117)	325 (180−587)	MACE, major bleeding, CV mortality, recurrent MI
			pPCI	291	—	59.7 ± 10.8	12.8	Hypertension (47%), diabetes (31%), dyslipidemia (22%), smoking (41%), previous MI (12%), CKD (2%)	70 (60−98)	320 (205−525)	
Alarcon Santos[7] (2019)	Peru	1 y	PIS	33	Alteplase (full dose)	—	—	—	—	—	MACE, major bleeding, all-cause mortality, recurrent MI, stroke
			pPCI	116	—	—	—	—	—	—	

CABG, coronary artery bypass graft surgery; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; CV, cardiovascular.; MACE, major adverse cardiovascular event; MI, myocardial infarction; PCI, percutaneous coronary intervention; PIS, pharmaco-invasive strategy; pPCI, primary PCI; STEMI, ST-elevation myocardial infarction.

*Numerical data were reported as mean ± standard deviation, or median (interquartile range).

†Time from first medical contact to reperfusion treatment.

minutes (Table 1). In relation to the antiplatelet agents used in each study, this information was available only in the study by Araiza et al., who reported that 97%, 85%, and 11% of patients received aspirin, clopidogrel, and prasugrel and/or ticagrelor, respectively.[8] In addition, drug-eluting stents were used in all studies.

Primary outcomes

In the pooled analysis, the risk of MACE, assessed in 3 studies (n = 1128),[7,8,12] was similar between the pharmaco-invasive strategy and the primary PCI groups (crude RR 0.82, 95% CI 0.59-1.16, $P = 0.260$, $I^2 = 0\%$;l Fig. 2A). Furthermore, these 3 studies reported adjusted effect measures showing no significant differences between pharmaco-invasive strategy and primary PCI groups (Supplemental Table S3).

The risk of major bleeding was assessed in all of 6 studies (n = 6621),[7-12] showing no significant difference between the pharmaco-invasive strategy and the primary PCI groups (crude RR 1.18, 95% CI 0.69-2.02, $P = 0.540$, $I^2 = 0\%$; Fig. 2B). Two of these 6 studies reported adjusted effect measures,[8,12] finding a similar risk between both groups (Supplemental Table S3).

Secondary outcomes

All-cause mortality was assessed in 5 studies (n = 6042),[7,9-12] reporting a similar risk between the pharmaco-invasive strategy and the primary PCI groups (crude RR 0.70; 95% CI 0.47-1.05, $P = 0.090$, $I^2 = 0\%$; Fig. 3A).

Two of 6 studies assessed cardiovascular mortality (n = 751).[8,9] No significant differences were found between the pharmaco-invasive strategy and the primary PCI groups (crude RR 0.80; 95% CI 0.44-1.44, $P = 0.450$, $I^2 = 0\%$; Fig. 3B).

In the 3 studies reporting information on recurrent myocardial infarction (n = 1128),[7,8,12] the risk was similar between the pharmaco-invasive strategy and the primary PCI groups (crude RR 0.54; 95% CI 0.18-1.61, $P = 0.270$, $I^2 = 0\%$; Fig. 3C).

Stroke was assessed in 3 studies.[7,9,12] Among 721 patients, the risk of stroke was similar between those who underwent the pharmaco-invasive strategy vs primary PCI (crude RR 1.27, 95% CI 0.17-9.73, $P = 0.820$, $I^2 = 27\%$; Fig. 3D).

Risk-of-bias assessment

The risk of bias was deemed to be critical in 3 studies,[7,10,11] serious in 2 studies,[9,12] and moderate in 1 study[8] (Supplemental Fig. S2). The most frequent reasons for a serious and/or critical risk of bias were incomplete or lack of adjustment for confounders (n = 4 of 6), inappropriate selection of participants (n = 5 of 6), misclassification of interventions (n = 3 of 6), and deviations from intended interventions (n = 3 of 6).

Discussion

Our meta-analysis from 6 observational studies of 6621 patients from Latin American countries with STEMI found that those who underwent the pharmaco-invasive strategy vs primary PCI have similar outcomes of MACE and major bleeding. Likewise, the risk of all-cause mortality,

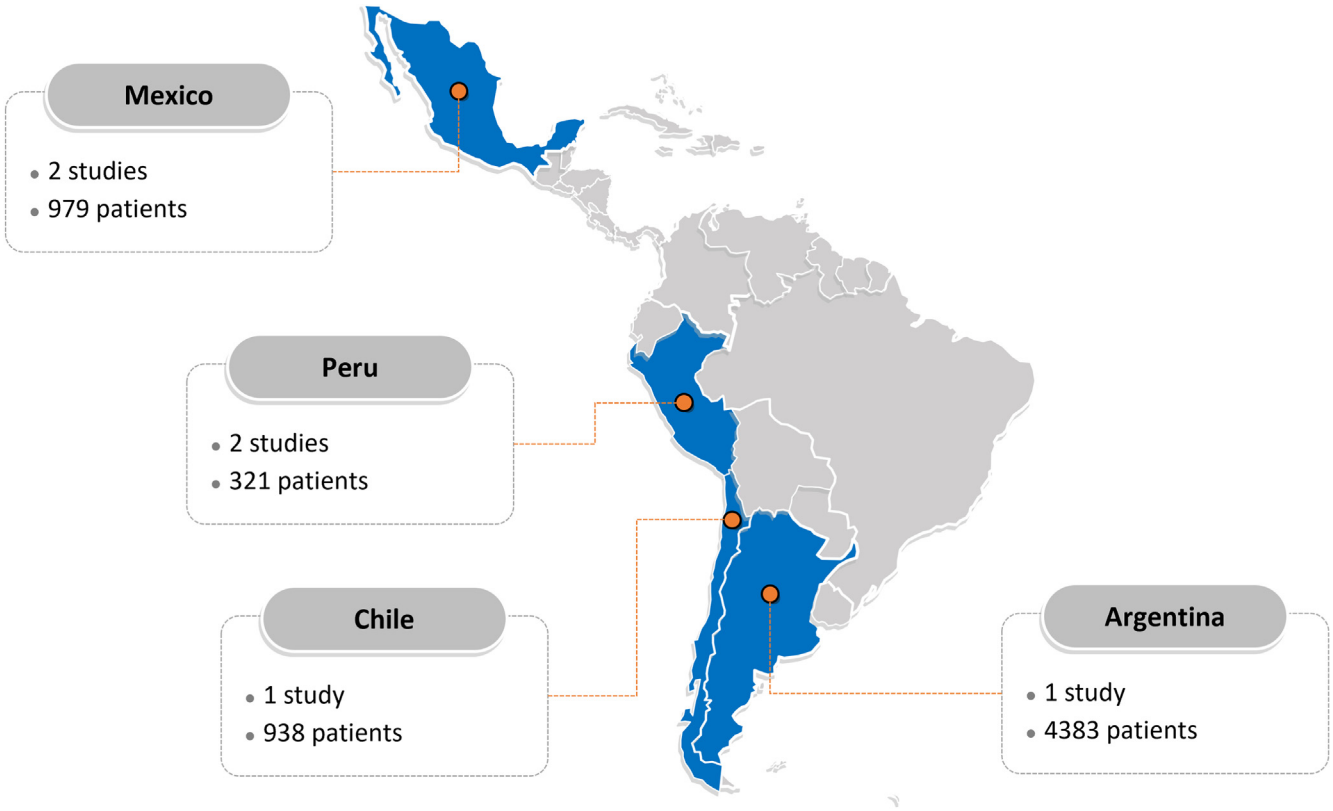

Figure 1. Number of included studies and sample size by country.

cardiovascular mortality, recurrent myocardial infarction, and stroke did not differ between the 2 strategies. However, most of the studies had a high risk of bias.

A recent network meta-analysis of clinical trials demonstrated the superiority of primary PCI over other reperfusion therapies in patients with STEMI,[13] with the pharmaco-invasive strategy being the second most favorable approach, with a 21% lower risk of mortality compared to standard fibrinolytic therapy.[13] However, this scenario is uncommon in many Latin American countries, where some have only one 24-hour PCI centre and lack established heart attack networks, provoking significant delays in delivery of reperfusion.[3] In such settings, initial fibrinolysis followed by routine early coronary angiography might be the most cost-effective strategy for reducing MACE.[2]

Some previous randomized controlled trials compared the pharmaco-invasive strategy vs primary PCI. The Strategic Reperfusion Early after Myocardial Infarction (STREAM) trial included about 2000 patients with STEMI from Canada, Europe, and Latin America who presented within 3 hours of symptom onset.[14] No difference in cardiovascular events had occurred at 30 days for patients who received the pharmaco-invasive strategy vs the primary PCI group (12.4% vs 14.3%, $P = 0.210$). Likewise, in a subsequent study,[15] the incidence of 1-year follow-up mortality also was found to be similar between the 2 groups (6.7% vs 5.9%, $P = 0.930$). Similarly, in the STREAM-2 study that compared both treatment strategies in older adult patients with STEMI,[16] no differences were found in major cardiovascular events between the pharmaco-invasive strategy and the primary PCI group (12.8% vs 13.3%) at the 30-day follow-up. In the STREAM trial,[14] patients from Brazil and Peru were included, representing only 4.3% of the total population, whereas in the STREAM-2 trial,[16] 20% of patients were from Mexico, Brazil, or Chile. However, no subgroup analysis by region was performed to show the results for the Latin American population. On the other hand, 2 previous clinical trials performed in Spain and China found that the pharmaco-invasive strategy had a higher proportion of complete myocardial and epicardial reperfusion treatment than primary PCI.[17,18]

An interesting point to note is that some large registries also have provided evidence of the benefit of the pharmaco-invasive strategy. The Vital Heart Response Registry, which included 5583 patients from Canada,[19] showed that the pharmaco-invasive strategy was superior to primary PCI in reducing the 1-year risk of MACE (17% vs 23.9%, $P < 0.001$), whereas maintaining a similar rate of major bleeding between the 2 groups (8.1% vs 7.9%, $P = 0.867$). The French FAST-MI Registry showed that the 1-year survival rate was similar for patients receiving the pharmaco-invasive strategy vs those receiving primary PCI (94% vs 93%).[20] These studies show that a well-organized STEMI network with options for either reperfusion strategy can leverage the benefits of a pharmaco-invasive approach effectively. Overall, these studies show that the pharmaco-invasive strategy could be a valid alternative to use of primary PCI, although the evidence is more robust for cases in which the time from symptom onset is < 3-6 hours.

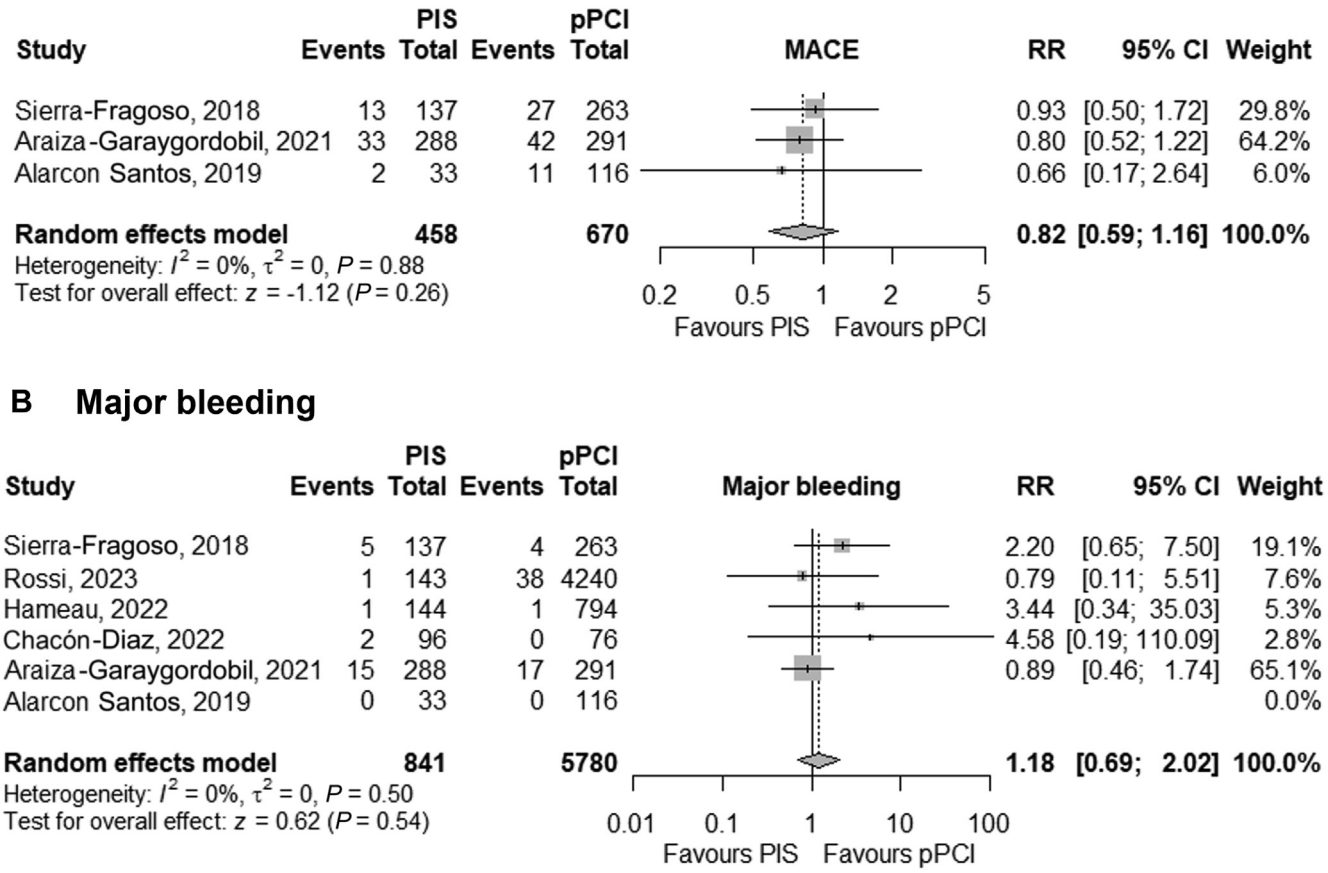

Figure 2. Forest plot showing the relative risk (RR) between type of strategy and (**A**) major adverse cardiovascular event (MACE) and (**B**) major bleeding. CI, confidence interval; MACE, major adverse cardiovascular event; PIS, pharmaco-invasive strategy; pPCI, primary percutaneous coronary intervention.

Our review found that heterogeneity was present in the ischemic times, which were longer in the pharmaco-invasive strategy group compared to those in the primary PCI group in the Mexican studies, as compared to the times in studies from other countries.[8,12] This finding could be attributed to several factors specific to the local context. Mexico's healthcare system, particularly in metropolitan areas, faces significant logistic challenges, including heavy traffic, long transfer distances, and a high demand for limited PCI-capable centres. These factors likely contribute to delays in delivery of reperfusion treatment, especially in cases in which fibrinolysis is administered at non-PCI centres and patients then must be transferred for subsequent PCI treatment. Thus, primary PCI may be the best choice for late-presenting STEMI cases (6-12 hours post−symptom onset), whereas a pharmaco-invasive approach could be more effective for patients presenting within 3 hours. Tailoring the reperfusion strategy to the timing of presentation and regional logistic factors is essential for improving care in this context.

The increased risk of bleeding associated with fibrinolytic therapy in the pharmaco-invasive strategy is a well-established concern, particularly when it is coupled with the issues relating to use of anticoagulants and antiplatelet medications during the PCI procedure.[21] In the STREAM-2 study,[16] the risk of intracranial hemorrhage was found to be numerically higher in the pharmaco-invasive strategy group compared with the primary PCI group (1.5% vs 0%). Our findings did not reveal an increased risk of major bleeding among patients who underwent this strategy, a result that can be attributed to several factors related to the interventions. Most patients who receive a pharmaco-invasive strategy are treated with PCI several hours after the initial fibrinolysis, allowing its complete elimination from the circulation.[22] Furthermore, bleeding prevention strategies are now used to avoid bleeding during invasive procedures, such as radial arterial access, which is associated with lower bleeding rates than femoral access.[23] Nevertheless, an important point to consider is that intracranial and gastrointestinal bleeding potentially can occur with fibrinolysis, especially in older patients.[14,15] Thus, using every available resource to minimize bleeding in this setting is crucial. Regarding this point, the recommended time to perform PCI after a successful reperfusion treatment with lytic is within 2 and 24 hours, to minimize bleeding and avoid reocclusion.[2] In Araiza et al.'s study,[8] the time reported was 22 hours (range: 6-48), and in the rest of the studies, this time was not specified.

The need for rescue PCI is critical in the pharmaco-invasive approach, as about one-third of patients may not

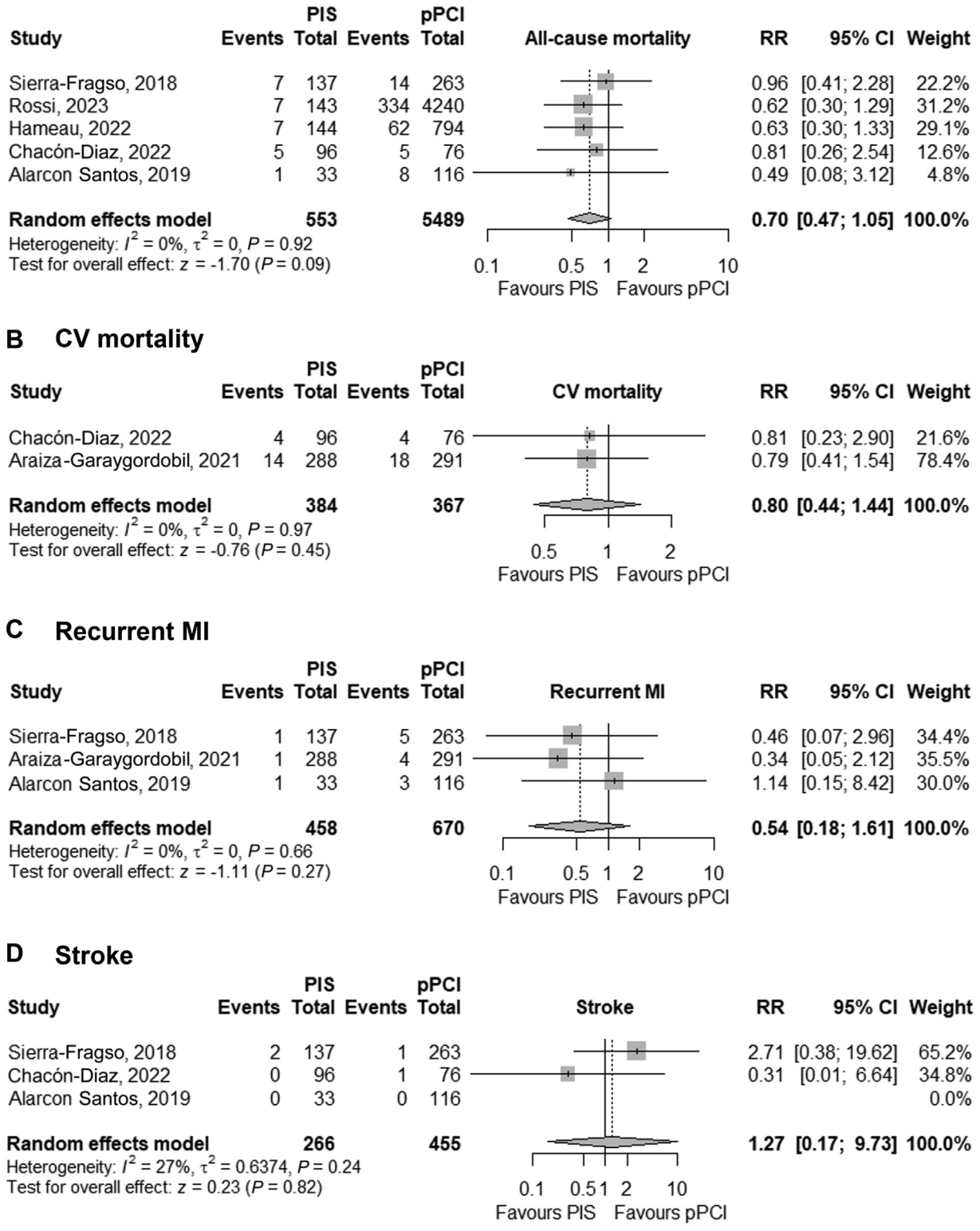

Figure 3. Forest plot showing the relative risk (RR) between type of strategy and (**A**) all-cause mortality, (**B**) cardiovascular (CV) mortality, (**C**) recurrent myocardial infarction (MI), and (**D**) stroke. CI, confidence interval;.PIS, pharmaco-invasive strategy; pPCI, primary percutaneous coronary intervention.

achieve successful reperfusion with fibrinolysis alone.[24] A post hoc analysis of the STREAM trial showed that patients who required rescue PCI had a worse 30-day prognosis than that of those who received scheduled angiography after successful fibrinolysis.[25] Therefore, the need for after-hours catheterization laboratories to attend these cases and improve patient outcomes through timely intervention should be emphasized. In addition, the selection of fibrinolytic agents such as tenecteplase rather than alteplase also is important because of its increased specificity to fibrin and its more favourable pharmacokinetic profile.[26] Studies have shown that tenecteplase was associated with a reduced risk of major bleeding, compared to alteplase, without a compromise in efficacy in achieving reperfusion or affecting 30-day mortality rates.[26] These advantages make tenecteplase a preferred option in the pharmaco-invasive management of patients with STEMI.

Notably, our systematic review has important implications for clinical practice and public health. The lack of differences between reperfusion strategies for STEMI underscores the importance of tailoring treatment approaches to individual patient characteristics.[3] This need for tailoring suggests that in resource-constrained settings or areas where rapid access to catheterization facilities may be challenging, a pharmaco-invasive approach could be a pragmatic alternative without compromising patient safety.[27] The integration of telemedicine in adoption of the pharmaco-invasive strategy further enhances its practicality.[28] Telemedicine facilitates prompt remote consultations and ECG assessments, expediting the initial diagnosis and administration of thrombolytic therapy. This approach not only aligns with the evolving landscape of digital healthcare but also contributes to optimizing healthcare resources.[29] Policymakers, armed with the knowledge of comparable outcomes and the additional benefits of telemedicine, can make informed decisions for resource allocation, promoting a more flexible and adaptive approach to STEMI management without compromising the quality of care.[30] We deeply believe that for an economic and geographic reality such as Latin America, the pharmaco-invasive strategy could be the appropriate strategy; and that to achieve the objective of carrying it out the best possible way, joint work between governments and health institutions is required.

Our study has some limitations. First, because only observational studies were included, confounding bias has a risk of affecting effect estimates. Therefore, our results should be interpreted with caution. Second, the variability in the follow-up duration across the included studies may limit the generalizability of our findings for long-term outcomes and could contribute to potential bias, despite the lack of substantial heterogeneity observed in our meta-analysis. Third, a meta-analysis of adjusted effect measures could not be performed, as they were reported inconsistently. However, the adjusted estimates described in each study were similar to our main results. Fourth, given that data for most Latin American countries were not available, our results may not be extrapolated to the rest of the region. However, we consider that the limitations in the organization of health systems for the care of patients with STEMI are similar among low-resource countries. Finally, some heterogeneity was present in the definition of MACE and major bleeding, type and dose of fibrinolytic, and the time since onset of symptoms, variables that could influence the results.

Conclusions

Our study suggests that a pharmaco-invasive strategy presents a similar risk of cardiovascular events and major bleeding, compared to use of primary PCI in patients with STEMI in Latin America. However, the risk of bias was serious or critical in almost all studies. Therefore, more-robust studies, such as randomized controlled trials or observational studies using a target trial emulation framework still are needed to evaluate its effectiveness to support its widespread implementation in Latin America and other low-resource settings.

Data Availability Statement

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

Ethics Statement

Only information from published studies was used, so no ethics board review was required.

Patient Consent

Only information from published studies was used, so patient consent was not required.

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Disclosures

The authors have no conflicts of interest to disclose.

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Supplementary Data

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