Medical and Health Journal
Volume 5, Issue 1, 2025, pp. 123-131
e-ISSN: 2807-3541
Open Access: https://jos.unsoed.ac.id/index.php/mhj

PCI Revascularization Strategies in Patients with Acute Myocardial Infarction and Multivessel Disease

Sidhi Laksono[1,2*], Wella Widyani[3]

[1]Divisi Kardiologi Intervensi dan Penyakit Jantung Struktural, Departemen Kardiologi dan Kedokteran Vaskuler, RS Pusat Jantung Siloam, Cinere, Indonesia

[2]Fakultas Kedokteran Universitas Muhammadiyah Prof. Dr. Hamka, Tangerang, Indonesia

[3]Yayasan Intervensi Sekat Struktural Indonesia, Jakarta, Indonesia

ARTICLE INFO

Article history:
Received July 7, 2025
Revised July 15, 2025
Accepted August 4, 2025
Available online August 9, 2025

Keywords:
acute myocardial infarction; multivessel disease; percutaneous coronary intervention; revascularization strategy

ABSTRACT

Background: *The incidence of Acute Myocardial Infarction (AMI) accompanied by Multivessel Disease (MVD) has increased annually, necessitating appropriate revascularization strategies to minimize clinical risks.* ***Objective:*** *This study aimed to evaluate various revascularization strategies using Percutaneous Coronary Intervention (PCI) that can be applied in patients with AMI and MVD.* ***Methods:*** *A systematic review was conducted using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method. The keywords used were ("Revascularization" AND "Multivessel Disease" AND "Acute Coronary Syndrome") OR ("Revascularization" AND "Multivessel Disease" AND "Acute Myocardial Infarction"). Articles were collected based on inclusion criteria: original articles, published in English, and published between 2020 and 2025.* ***Results:*** *A total of 1,263 articles were found in the initial search. Of these, 169 were excluded due to duplication, 1,069 due to irrelevant PICO criteria, and 6 due to limited access. From the remaining 19 articles, it was found that revascularization strategies could be classified based on the number of vessels treated (culprit-only, incomplete, and complete revascularization) and the timing of the intervention (immediate and staged revascularization).* ***Conclusion:*** *No single strategy was superior in all contexts. The choice of revascularization strategy should be individualized based on each patient's clinical status and coronary anatomy to optimize outcomes.*

1. INTRODUCTION

Coronary artery disease remains the leading cause of morbidity and mortality worldwide. The growing prevalence of obesity and diabetes, coupled with an aging population, has contributed to a steady increase in the number of individuals affected by this condition (Akbari & Al-Lamee, 2022). Among the most rapidly increasing manifestations of coronary disease is acute myocardial infarction (AMI), which is diagnosed when there is evidence of myocardial injury, marked by an elevation in cardiac troponin levels (at least one value above the 99th percentile upper reference limit), accompanied by myocardial necrosis within a clinical context consistent with ischemia (Ibanez et al., 2018).

AMI is broadly classified into ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI). STEMI is characterized by typical symptoms of myocardial infarction occurring within the previous 12 hours, ST-segment elevation of ≥1 mm in two contiguous leads or ≥2 mm in precordial leads on electrocardiography, and angiographic evidence of acute coronary artery occlusion or sub-occlusion (Ibanez et al., 2018). NSTEMI presents with acute chest pain but without persistent ST-segment elevation. Electrocardiographic changes may include ST-segment depression, T-wave inversion, flattened or pseudonormalized T waves, or may even appear normal. Pathologically, NSTEMI involves myocardial necrosis due to ischemia without total coronary artery occlusion (Roffi et al., 2016).

*Corresponding author
E-mail addresses: sidhilaksono@uhamka.ac.id (Sidhi laksono)

In many cases, AMI is not confined to a single coronary artery. Significant stenosis may also be present in other vessels, a condition known as multivessel disease (MVD). MVD is defined as the presence of at least one angiographically significant stenosis in a non-culprit vessel with a diameter of ≥2.5 mm, which is not treated during the initial culprit-lesion intervention (Mehta Shamir et al., 2019). Studies have shown that approximately 16% of patients with AMI have MVD identified during coronary angiography (Khaled et al., 2022). Other research has reported MVD prevalence of 21.69% in the general study population, with 19.35% experiencing AMI (Gabriel et al., 2021). In a cohort of 3,722 NSTEMI cases, 42% were found to have MVD (Baumann et al., 2022). While in STEMI patients, the prevalence reached 32% (Sustersic et al., 2021).

Patients with concurrent AMI and MVD are at a higher risk of experiencing major adverse cardiac events (MACE), which may include cardiovascular death, recurrent myocardial infarction, and unplanned revascularization procedures (Diender et al., 2022). To mitigate these risks, revascularization procedures are performed to restore blood flow to ischemic myocardial tissue. For AMI patients, two primary revascularization strategies are available: percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG). PCI has advanced significantly as the first-line treatment for patients with complex coronary artery disease, thanks to developments in drug-eluting stents, calcium modification techniques, and intravascular imaging. In contrast, CABG is an open-heart surgical procedure involving the grafting of vessels from the aorta to the coronary arteries to bypass ischemic segments and improve myocardial perfusion (Llerena-Velastegui et al., 2024).

Although revascularization strategy selection must be individualized based on clinical condition, PCI offers several advantages over CABG. As a minimally invasive procedure that involves catheter insertion to deploy a stent at the site of occlusion, PCI is associated with fewer periprocedural complications and faster recovery (Cho et al., 2019). Several PCI strategies are available for AMI patients with MVD, such as culprit-only PCI and multivessel PCI. In multivessel PCI, intervention may be performed either during the same session or in a staged manner (Bates et al., 2016). Some studies have shown that complete revascularization performed in stages yields better outcomes compared to culprit-only PCI (Aslanabadi et al., 2024). Other research has found that staged PCI carries a lower risk of MACE compared to immediate multivessel PCI (Wang et al., 2022). Different studies suggest that immediate multivessel PCI may result in superior clinical outcomes compared to staged PCI (Singh et al., 2024). These varying findings underscore the need for a comprehensive review to determine the most effective PCI strategy for patients with AMI and MVD.

This review aims to evaluate the range of PCI revascularization strategies applied in patients with AMI and MVD, focusing on the treatment of non-culprit lesions and the timing of intervention. It provides a comparative analysis of clinical outcomes across strategies and is intended as a resource for clinicians, particularly cardiologists, internal medicine residents, and cardiovascular researchers, to support evidence-based decision-making in revascularization planning.

2. METHOD

This study was a systematic review conducted through a comprehensive online search using PubMed, ScienceDirect, and Scopus. Articles were retrieved using the keywords (“Revascularization" AND "Multivessel Disease" AND "Acute Coronary Syndrome”) OR (“Revascularization" AND "Multivessel Disease" AND "Acute Myocardial Infarction”). The search was limited to original research articles published in English between 2020 and 2025. Exclusion criteria included non-open-access articles and the selection of only one article when multiple similar versions were identified across different databases. The collected articles were compiled using the Rayyan software. This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency and methodological rigor in study selection and reporting. After screening the search results by title and abstract, the authors reviewed the full texts and excluded articles according to the predefined criteria.

3. RESULT AND DISCUSSION

Result

The keyword-based search resulted in 1,263 articles, comprising 149 from PubMed, 942 from ScienceDirect, and 172 from Scopus. Due to duplication across sources, 169 articles were excluded during the initial screening, leaving 1,094 articles. After reviewing the titles, abstracts, and keywords, 25 articles were identified as relevant to the research topic. Subsequently, 6 of these articles were excluded due to inaccessible full texts. Therefore, only 19 articles were included in this systematic review (Figure 1).

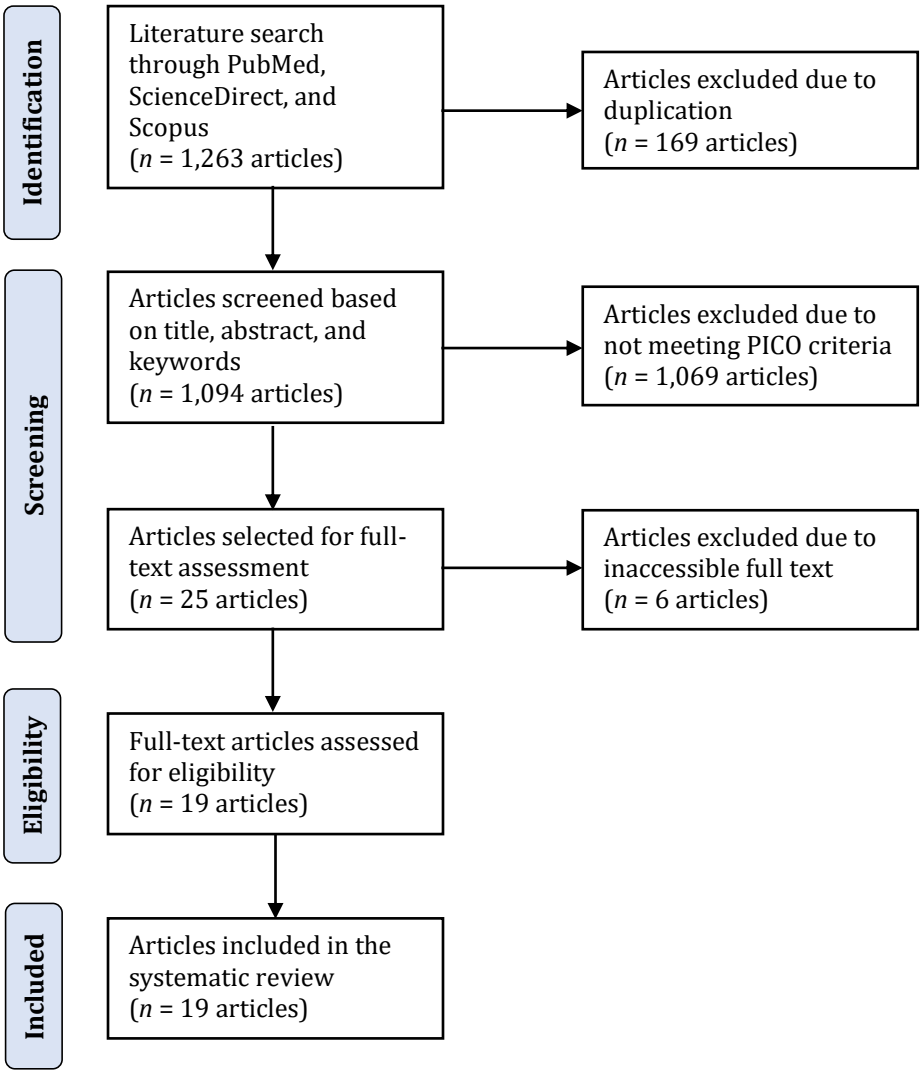

Figure 1. PRISMA Flow Diagram of Revascularization Strategies in AMI with MVD

Discussion

Revascularization strategies for patients with AMI and MVD remain a common clinical challenge in interventional cardiology. The presence of MVD in AMI is associated with a more extensive degree of myocardial ischemia and a worse long-term prognosis compared to single-vessel involvement. Therefore, selecting an appropriate revascularization strategy is a critical determinant in reducing mortality and morbidity, as well as improving patients' quality of life. This review explores two primary aspects of revascularization strategies: the extent of vessel revascularization (culprit-only, incomplete, and complete revascularization) and the timing of the procedure (immediate versus staged revascularization).

Number of Revascularized Vessels: Culprit-only, Incomplete, and Complete Revascularization

The Culprit-Only (CO) strategy refers to percutaneous coronary intervention (PCI) limited to the infarct-related artery (IRA) responsible for the myocardial infarction, with other coronary lesions managed conservatively with medical therapy (Chen & Lu, 2025; Jain et al., 2023). This approach is commonly chosen in the acute setting, particularly when hemodynamic stabilization is the immediate priority. Comparative studies between CO and multivessel revascularization (MVR) have reported no significant differences in major adverse cardiovascular events (MACE) (Tovar Forero et al., 2020). Similarly, after statistical adjustment, no significant differences were found between CO and MVR in terms of all-cause mortality, cardiovascular death, target lesion revascularization (TLR), target vessel revascularization (TVR), and stent thrombosis (Kim et al., 2020), suggesting comparable clinical outcomes.

However, several studies have shown that MVR is associated with better outcomes in certain clinical parameters. The CO approach was found to increase the incidence of MACE within the first 30 days post-intervention, along with a higher risk of other major adverse events, including all-cause death, myocardial infarction, stent thrombosis, stroke, and major bleeding, compared to MVR (Li et al., 2023). Other studies also reported that CO significantly increased the risk of all-cause mortality, non-TVR events, and recurrent angina in comparison to MVR (Chen & Lu, 2025; Kim et al., 2020; Tovar Forero et al., 2020). These differing outcomes underscore the need for individualized decision-making when employing the CO approach in AMI patients with MVD.

Incomplete Revascularization (IR) is another MVR strategy that involves PCI on the IRA as well as some, but not all, significant lesions in non-IRA vessels (Kim et al., 2020). A study involving 104 patients reported no statistically significant difference in cumulative MACE between the IR and complete revascularization groups. Secondary outcomes, including individual MACE components and major bleeding, also showed no meaningful differences. Although the incidence of stroke was lower in the IR group, the difference was not statistically significant (Kim et al., 2025). These findings suggest that the long-term effects of IR may vary among specific patient subpopulations and warrant further evaluation.

The Complete Revascularization (CR) strategy involves PCI on all significantly stenotic lesions (≥70%) in coronary arteries with a diameter ≥2.5 mm (Park et al., 2023). Another definition includes treatment of all lesions deemed appropriate for revascularization by the operator, achieving a final TIMI flow grade of 2 or 3 with residual stenosis <30% (Tovar Forero et al., 2020). Patients undergoing CR within 48–72 hours of primary PCI had significantly better clinical outcomes compared to those treated with PCI limited to the IRA. CR was associated with significant reductions in cardiac mortality, recurrent myocardial infarction, refractory angina, and the need for repeat revascularization (Jain et al., 2023). Supporting evidence also shows that CR reduced the risk of MACE by up to 70% compared to IR (Marino et al., 2022; Tovar Forero et al., 2020). Although no significant difference in left ventricular ejection fraction (LVEF) was observed at hospital discharge between CR and IR groups, the CR group demonstrated a significantly greater improvement after one year (Jain et al., 2023).

Further studies found that CR was associated with reduced rates of target lesion failure (TLF) and patient-oriented composite endpoint (POCE) at one year, primarily driven by lower rates of all-cause mortality and repeat revascularization (Jiménez Díaz et al., 2025). In addition, CR yielded specific benefits in certain subgroups; for instance, among hypertensive patients, CR significantly reduced adverse outcomes at both 6 and 12 months compared to other strategies (Chen & Lu, 2025).

Although most studies favor CR over IR, others have found no significant differences in cumulative MACE, including all-cause mortality, cardiovascular death, recurrent myocardial infarction, TLR, TVR, and stent thrombosis between the two groups (Chen & Lu, 2025; Kim et al., 2025; Kim et al., 2020). Overall, CR appears to offer consistent long-term benefits, especially in reducing symptoms, the need for repeat interventions, and the risk of major cardiovascular events, without increasing the risk of serious complications. Nonetheless, the selection of revascularization strategy should be tailored to the patient's clinical status and coronary anatomy.

Timing of Revascularization: Immediate versus Staged Revascularization

Immediate Revascularization refers to PCI performed during the initial (index) procedure, with no planned follow-up interventions, followed only by medical therapy (Park et al., 2023; Tovar Forero et al., 2020). This approach has been associated with lower MACE rates compared to staged PCI, including reductions in cardiovascular death, cardiac complications, and hospital readmissions. These outcomes may be influenced by the presence of less severe lesions, different distributions of culprit vessels, and fewer unplanned revascularizations (Aquino-Bruno et al., 2023; Tovar Forero et al., 2020). Immediate PCI was also found to significantly reduce the risk of myocardial infarction and unplanned revascularization due to ischemia. Notably, the reduction in myocardial infarction remained significant even after excluding procedure-related events (Diletti et al., 2023; Jacob J. Elscot et al., 2024). Despite these findings, other studies have reported that immediate PCI did not result in statistically significant reductions in the composite primary outcomes compared to staged PCI (J. J. Elscot et al., 2024; Elscot et al., 2025; Jacob J. Elscot et al., 2024; Lim et al., 2024; Tea et al., 2022). These discrepancies suggest that the effectiveness of immediate revascularization may depend heavily on individual clinical and anatomical characteristics.

Staged Revascularization, in contrast, refers to a coronary intervention strategy in which PCI of non-culprit lesions is performed separately from the index procedure. Initially, the IRA is treated, followed by planned PCI of other lesions either during the same hospitalization or after discharge, typically within 2 to 6 weeks (Park et al., 2023; Tovar Forero et al., 2020). Several studies suggest that staged PCI may yield superior clinical outcomes compared to immediate PCI. For example, patients undergoing staged revascularization showed statistically significant reductions in composite endpoints, including cardiovascular and all-cause mortality (Fabris et al., 2021). This is supported by additional data showing that immediate PCI was associated with a 90% increased risk of mortality compared to the staged approach, regardless of AMI type (Liu et al., 2021).

Although some data suggest a trend toward better outcomes with the staged strategy, not all differences reach statistical significance. For instance, in patients with non-ST-elevation acute coronary syndrome (NSTE-ACS), the difference in composite outcomes between immediate and staged PCI was minimal and statistically insignificant (Elscot et al., 2025). Another study also found that although the immediate group had numerically higher rates of MACE and all-cause mortality than the staged group, the differences were not statistically significant (Park et al., 2023). Overall, staged revascularization appears to offer consistent protection against major adverse cardiac events, including reductions in recurrent myocardial infarction and repeat revascularization due to ischemia. These benefits have been observed across various age groups, suggesting that the staged approach may be a rational choice, particularly for patients with complex lesions or unstable clinical conditions (Bainey et al., 2024; Fabris et al., 2021).

4. CONCLUSION

Revascularization strategies in patients with AMI and MVD play a critical role in determining prognosis. The complete revascularization approach generally provides better clinical outcomes compared to incomplete or culprit-only revascularization, particularly in reducing the risk of major adverse cardiovascular events (MACE), recurrent myocardial infarction, and repeat revascularization. Based on timing, immediate revascularization is effective in lowering the incidence of infarction and unplanned revascularization. However, staged revascularization tends to be safer in patients with complex or unstable conditions. Overall, no single strategy is universally superior for all patients with AMI and MVD. The selection of the optimal approach requires an individualized assessment that considers clinical stability, coronary anatomy, and the risks and benefits of each option. A personalized, evidence-based strategy remains essential in improving clinical outcomes and patients' quality of life.

5. REFERENCES

Akbari, T., & Al-Lamee, R. (2022). Percutaneous Coronary Intervention in Multi-Vessel Disease. *Cardiovasc Revasc Med*, *44*, 80-91. https://doi.org/10.1016/j.carrev.2022.06.254

Aquino-Bruno, H., García-García, J. F., Muratalla-González, R., Alcántara-Meléndez, M. A., Morales-Portano, J. D., Gómez-álvarez, E. B., Merino-Rajme, J. A., Castro-Rubio, J. A., & Corona, J. C. P. (2023). Complete revascularization with PCI in STEMI patients with multivessel disease, when is the appropriate time? [Article]. *Archivos de Cardiologia de Mexico*, *93*(1), 53-61. https://doi.org/10.24875/ACM.21000375

Aslanabadi, N., Mashayekhi, S., Rezvani, M., Abdollahzadeh, A., & Hajialigol, A. (2024). A Comparison Between Culprit Versus Complete Revascularization in Diabetic Patients With Acute Myocardial Infarction. *Clin Cardiol*, *47*(11), e70046. https://doi.org/10.1002/clc.70046

Bainey, K. R., Wood, D. A., Bossard, M., Campo, G., Cantor, W. J., Lavi, S., Madan, M., Mehran, R., Pinilla-Echeverri, N., Rao, S., Sarma, J., Sheth, T., Stankovic, G., Steg, P. G., Storey, R. F., Tanguay, J.-F., Velianou, J. L., Welsh, R. C., Mani, T., . . . Mehta, S. R. (2024). Effects of complete revascularization according to age in patients with ST-segment elevation myocardial infarction and multivessel disease (COMPLETE-AGE). *American Heart Journal*, *267*, 70-80. https://doi.org/https://doi.org/10.1016/j.ahj.2023.10.004

Bates, E. R., Tamis-Holland, J. E., Bittl, J. A., O'Gara, P. T., & Levine, G. N. (2016). PCI Strategies in Patients With ST-Segment Elevation Myocardial Infarction and Multivessel Coronary Artery Disease. *Journal of the American College of Cardiology*, *68*(10), 1066-1081. https://doi.org/https://doi.org/10.1016/j.jacc.2016.05.086

Baumann, A. A. W., Tavella, R., Air, T. M., Mishra, A., Montarello, N. J., Arstall, M., Zeitz, C., Worthley, M. I., Beltrame, J. F., & Psaltis, P. J. (2022). Prevalence and real-world management of NSTEMI with multivessel disease. *Cardiovasc Diagn Ther*, *12*(1), 1-11. https://doi.org/10.21037/cdt-21-518

Chen, R., & Lu, J. (2025). Comparison of complete vs. culprit-only revascularization in acute myocardial infarction. *BMC Cardiovasc Disord*, *25*(1), 325. https://doi.org/10.1186/s12872-025-04777-7

Cho, S. C., Park, D. W., & Park, S. J. (2019). Percutaneous Coronary Intervention and Coronary Artery Bypass Grafting for the Treatment of Left Main Coronary Artery Disease. *Korean Circ J*, *49*(5), 369-383. https://doi.org/10.4070/kcj.2019.0112

Diender, E., Vermeulen, J. J. M., Pisters, R., van Schaik, P. M., Reijnen, M., & Holewijn, S. (2022). Major adverse cardiac events after elective infrarenal endovascular aortic aneurysm repair. *J Vasc Surg*, *76*(6), 1527-1536.e1523. https://doi.org/10.1016/j.jvs.2022.05.018

Diletti, R., den Dekker, W. K., Bennett, J., Schotborgh, C. E., van der Schaaf, R., Sabaté, M., Moreno, R., Ameloot, K., van Bommel, R., Forlani, D., van Reet, B., Esposito, G., Dirksen, M. T., Ruifrok, W. P. T., Everaert, B. R. C., Van Mieghem, C., Elscot, J. J., Cummins, P., Lenzen, M., . . . Van Mieghem, N. M. (2023). Immediate versus staged complete revascularisation in patients presenting with acute coronary syndrome and multivessel coronary disease (BIOVASC): a prospective, open-label, non-inferiority, randomised trial [Article]. *The Lancet*, *401*(10383), 1172-1182. https://doi.org/10.1016/S0140-6736(23)00351-3

Elscot, J. J., Kakar, H., Dekker, W. K. D., Bennett, J., Sabaté, M., Esposito, G., Daemen, J., Boersma, E., Van Mieghem, N. M., & Diletti, R. (2024). Complete Revascularization Strategies in Women and Men With Acute Coronary Syndrome and Multivessel Disease [Article]. *American Journal of Cardiology*, *214*, 25-32. https://doi.org/10.1016/j.amjcard.2023.12.044

Elscot, J. J., Kakar, H., den Dekker, W. K., Bennett, J., Sabaté, M., Esposito, G., Boersma, E., McFadden, E., Garcia-Garcia, H. M., Van Mieghem, N. M., & Diletti, R. (2025). Immediate versus staged complete revascularization in patients presenting with multivessel disease and ST- or non-ST-segment elevation acute coronary syndrome. *International Journal of Cardiology*, *437*, 133496. https://doi.org/https://doi.org/10.1016/j.ijcard.2025.133496

Elscot, J. J., Kakar, H., Scarparo, P., den Dekker, W. K., Bennett, J., Schotborgh, C. E., van der Schaaf, R., Sabaté, M., Moreno, R., Ameloot, K., van Bommel, R. J., Forlani, D., Van Reet, B., Esposito, G., Dirksen, M. T., Ruifrok, W. P. T., Everaert, B. R. C., Van Mieghem, C., Pinar, E., . . . Diletti, R. (2024). Timing of Complete Multivessel Revascularization in Patients Presenting With Non-ST-Segment Elevation Acute Coronary Syndrome. *JACC: Cardiovascular Interventions*, *17*(6), 771-782. https://doi.org/https://doi.org/10.1016/j.jcin.2024.01.278

Fabris, E., Pezzato, A., Gregorio, C., Barbati, G., Falco, L., Albani, S., Stolfo, D., Vitrella, G., Rakar, S., Perkan, A., & Sinagra, G. (2021). STEMI and Multivessel Disease: Medical Therapy Amplifies the Benefit of Complete Myocardial Revascularisation. *Heart, Lung and Circulation*, *30*(12), 1846-1853. https://doi.org/https://doi.org/10.1016/j.hlc.2021.06.522

Gabriel, S., Herepath, M., Zhang, X., Were, J. J., Ruzangi, J., & O'Connell, S. P. (2021). Clinical burden of MACE in patients with multivessel disease during the early period following acute myocardial infarction. *European Heart Journal*, *42*(Supplement_1). https://doi.org/10.1093/eurheartj/ehab724.1330

Ibanez, B., James, S., Agewall, S., Antunes, M. J., Bucciarelli-Ducci, C., Bueno, H., Caforio, A. L. P., Crea, F., Goudevenos, J. A., Halvorsen, S., Hindricks, G., Kastrati, A., Lenzen, M. J., Prescott, E., Roffi, M., Valgimigli, M., Varenhorst, C., Vranckx, P., Widimský, P., & Group, E. S. C. S. D. (2018). 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *European Heart Journal*, *39*(2), 119-177. https://doi.org/10.1093/eurheartj/ehx393

Jain, C., Dash, P. K., Iyer, V. R., & Deshmukh, R. (2023). Culprit vessel only versus complete revascularization following thrombolysis in patients with ST elevation myocardial infraction and multivessel coronary artery disease - A prospective study [Article]. *Indian Heart Journal*, *75*(4), 274-278. https://doi.org/10.1016/j.ihj.2023.06.010

Jiménez Díaz, V. A., Routledge, H., Malik, F.-T.-N., Hildick-Smith, D., Guédès, A., Baello, P., Kuramitsu, S., Das, R., Dewilde, W., Portales, J. F., Angioi, M., Smits, P. C., & Romo, A. I. (2025). Complete versus incomplete revascularization in patients with a non-ST-elevation myocardial infarction: Analysis from the e-ULTIMASTER registry. *Cardiovascular Revascularization Medicine*, *75*, 25-30. https://doi.org/https://doi.org/10.1016/j.carrev.2024.07.011

Khaled, S., Jaha, N., & Shalaby, G. (2022). Clinical Characteristics and Short-Term Outcomes of Patients Presenting with Acute Myocardial Infarction having Multi-vessel disease - A Single Middle- eastern Tertiary-Care Center Experience. *Indian Heart Journal*, *74*(1), 28-33. https://doi.org/https://doi.org/10.1016/j.ihj.2021.11.184

Kim, S. O., Kim, H. J., Park, J. I., Choi, K. U., Nam, J. H., Lee, C. H., Son, J. W., Park, J. S., Her, S. H., Chang, K. Y., Ahn, T. H., Jeong, M. H., Rha, S. W., Kim, H. S., Gwon, H. C., Seong, I. W., Hwang, K. K., Hur, S. H., Cha, K. S., . . . Kim, U. (2025). Complete or incomplete revascularization in patients with left main culprit lesion acute myocardial infarction with multivessel disease: a retrospective observational study. *J Yeungnam Med Sci*, *42*, 18. https://doi.org/10.12701/jyms.2025.42.18

Kim, Y. H., Her, A.-Y., Jeong, M. H., Kim, B.-K., Hong, S.-J., Kim, S., Ahn, C.-M., Kim, J.-S., Ko, Y.-G., Choi, D., Hong, M.-K., & Jang, Y. (2020). Culprit-only versus multivessel or complete versus incomplete revascularization in patients with non-ST-segment elevation myocardial infarction and multivessel disease who underwent successful percutaneous coronary intervention using newer-generation drug-eluting stents. *Atherosclerosis*, *301*, 54-64. https://doi.org/https://doi.org/10.1016/j.atherosclerosis.2020.04.002

Li, Y. X., Wang, B. N., Fan, F. F., Zhang, Y., Jiang, J., Li, J. P., Han, Y. L., & Huo, Y. (2023). Thirty-day outcomes of in-hospital multi-vessel versus culprit-only revascularization strategy for ST-segment elevation myocardial infarction with multivessel coronary disease. *J Geriatr Cardiol*, *20*(7), 485-494. https://doi.org/10.26599/1671-5411.2023.07.005

Lim, Y., Jang, J., Lee, S. H., Ahn, J. H., Hong, Y. J., Ahn, Y., Jeong, M. H., Kim, C. J., Hahn, J. Y., Lee, J. M., Park, K. H., Choo, E. H., Ahn, S. G., Doh, J. H., Lee, S. Y., Park, S. D., Lee, H. J., Kang, M. G., Cho, Y. K., . . . Kim, M. C. (2024). Staged versus immediate complete revascularization for non-culprit arteries in acute myocardial infarction: a post-hoc analysis of FRAME-AMI. *Front Cardiovasc Med*, *11*, 1475483. https://doi.org/10.3389/fcvm.2024.1475483

Liu, E. S., Hung, C. C., Chiang, C. H., Chang, C. H., Cheng, C. C., Kuo, F. Y., Mar, G. Y., & Huang, W. C. (2021). Comparison of Different Timing of Multivessel Intervention During Index-Hospitalization for Patients With Acute Myocardial Infarction. *Front Cardiovasc Med*, *8*, 639750. https://doi.org/10.3389/fcvm.2021.639750

Llerena-Velastegui, J., Zumbana-Podaneva, K., Velastegui-Zurita, S., Mejia-Mora, M., Perez-Tomassetti, J., Cabrera-Cruz, A., Haro-Arteaga, P., de Jesus, A., Coelho, P. M., & Sanahuja-Montiel, C. (2024). Comparative Efficacy of Percutaneous Coronary Intervention Versus Coronary Artery Bypass Grafting in the Treatment of Ischemic Heart Disease: A Systematic Review and Meta-Analysis of Recent Randomized Controlled Trials. *Cardiol Res*, *15*(3), 153-168. https://doi.org/10.14740/cr1638

Marino, M., Digiacomo, S., Cacucci, M., Catanoso, A., Valentini, P., & Landolina, M. (2022). Complete Percutaneous Revascularization in Patients Aged ≥85 Years With Acute Coronary Syndrome and Multivessel Coronary Artery Disease. *The American Journal of Cardiology*, *180*, 10-16. https://doi.org/https://doi.org/10.1016/j.amjcard.2022.06.030

Mehta Shamir, R., Wood David, A., Storey Robert, F., Mehran, R., Bainey Kevin, R., Nguyen, H., Meeks, B., Di Pasquale, G., López-Sendón, J., Faxon David, P., Mauri, L., Rao Sunil, V., Feldman, L., Steg, P. G., Avezum, Á., Sheth, T., Pinilla-Echeverri, N., Moreno, R., Campo, G., . . . Cairns John, A. (2019). Complete Revascularization with Multivessel PCI for Myocardial Infarction. *New England Journal of Medicine*, *381*(15), 1411-1421. https://doi.org/10.1056/NEJMoa1907775

Park, S., Rha, S.-W., Choi, B. G., Cho, J. H., Park, S. H., Lee, J. B., Kim, Y. H., Park, S. M., Choi, J. W., Park, J. Y., Shin, E.-S., Lee, J. B., Suh, J., Chae, J. K., Choi, Y. J., Jeong, M. H., Cha, K. s., Lee, S. W., Kim, U., . . . Park, C. G. (2023). Immediate versus staged complete revascularization in patients with ST-segment elevation myocardial infarction and multivessel coronary artery disease: results from a prematurely discontinued randomized multicenter trial. *American Heart Journal*, *259*, 58-67. https://doi.org/https://doi.org/10.1016/j.ahj.2023.01.020

Roffi, M., Patrono, C., Collet, J. P., Mueller, C., Valgimigli, M., Andreotti, F., Bax, J. J., Borger, M. A., Brotons, C., Chew, D. P., Gencer, B., Hasenfuss, G., Kjeldsen, K., Lancellotti, P., Landmesser, U., Mehilli, J., Mukherjee, D., Storey, R. F., & Windecker, S. (2016). 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: Task Force for the Management of Acute

Coronary Syndromes in Patients Presenting without Persistent ST-Segment Elevation of the European Society of Cardiology (ESC). *Eur Heart J*, *37*(3), 267-315. https://doi.org/10.1093/eurheartj/ehv320

Singh, S., Garg, A., Chaudhary, R., Rout, A., Tantry, U. S., Bliden, K., & Gurbel, P. A. (2024). Meta-analysis of immediate complete vs staged complete revascularization in patients with acute coronary syndrome and multivessel disease. *Cardiovascular Revascularization Medicine*, *60*, 1-8. https://doi.org/https://doi.org/10.1016/j.carrev.2023.10.005

Sustersic, M., Mrak, M., Svegl, P., Kodre, A. R., Kranjec, I., Fras, Z., & Bunc, M. (2021). Complete Revascularization and Survival in STEMI. *Glob Heart*, *16*(1), 64. https://doi.org/10.5334/gh.1040

Tea, V., Morelle, J.-F., Gallet, R., Cayla, G., Lemesle, G., Lhermusier, T., Dillinger, J.-G., Ducrocq, G., Angouvant, D., Cottin, Y., Chamandi, C., le Bras, A., Steg, P. G., Montalescot, G., Nelson, A. C., Simon, T., Chatellier, G., Danchin, N., & Puymirat, E. (2022). Immediate versus staged complete myocardial revascularization in patients with ST-segment elevation myocardial infarction and multivessel disease: A post hoc analysis of the randomized FLOWER-MI trial. *Archives of Cardiovascular Diseases*, *115*(10), 496-504. https://doi.org/https://doi.org/10.1016/j.acvd.2022.05.011

Tovar Forero, M. N., Scarparo, P., den Dekker, W., Balbi, M., Masdjedi, K., van Zandvoort, L., Kardys, I., Ameloot, K., Daemen, J., Lemmert, M., Wilschut, J., de Jaegere, P., Zijlstra, F., Van Mieghem, N., & Diletti, R. (2020). Revascularization Strategies in Patients Presenting With ST-Elevation Myocardial Infarction and Multivessel Coronary Disease. *The American Journal of Cardiology*, *125*(10), 1486-1491. https://doi.org/https://doi.org/10.1016/j.amjcard.2020.01.050

Wang, C., Lang, J., Zhang, J., Hu, Y., Han, C., Xu, R., Wu, J., Liu, C., Li, W., Li, T., Wei, A., Qi, W., Jin, D., Cong, H., & Wang, L. (2022). Culprit vessel vs. immediate multivessel vs. out-of-hospital staged intervention for patients with non-ST-segment elevation myocardial infarction and multivessel disease. *Front Cardiovasc Med*, *9*, 1033475. https://doi.org/10.3389/fcvm.2022.1033475