e-ISSN: 2988-3237

Sriwijaya Journal of Internal Medicine (SJIM)

Journal website: https://phlox.or.id/index.php/sjim

Assessing the Efficacy of Cardiac Catheterization in Enhancing Blood Circulation in Patients with Coronary Heart Disease: A Systematic Literature Review

Khomariyana Purnama Sari[1*]

[1]Muhammadiyah Siti Khodijah Hospital, Kediri, Indonesia

ARTICLE INFO

Keywords:
Angina
Blood circulation
Cardiac catheterization
Coronary heart disease

***Corresponding author:**
Khomariyana Purnama Sari

E-mail address:
khomariyanap@gmail.com

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.59345/sjim.v2i1.102

A B S T R A C T

Introduction: Cardiac catheterization is a highly efficient treatment for enhancing blood circulation to the heart in individuals with coronary heart disease (CHD). This operation has the potential to alleviate angina, enhance quality of life, and mitigate the likelihood of myocardial infarction. The objective of this study is to investigate the efficacy of cardiac catheterization in enhancing blood circulation among individuals suffering from CHD. **Methods:** We conducted a literature search on multiple databases, including PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar, to investigate the efficacy of cardiac catheterization in enhancing blood circulation among individuals diagnosed with CHD. This study adheres to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Guidelines. **Results:** We identified twenty papers that satisfied the inclusion criteria in this investigation. The research articles were published between 2013 and 2023. The study analysis demonstrates that cardiac catheterization is efficacious in enhancing blood circulation in individuals with CHD. Cardiac catheterization can augment myocardial perfusion by up to 20%. **Conclusion:** Cardiac catheterization is more successful in individuals who have mild or moderate stenosis of the coronary arteries. The study analysis indicates that cardiac catheterization is efficacious in enhancing blood circulation in individuals with CHD.

1. Introduction

Coronary heart disease (CHD) is a leading global cause of mortality. CHD affects approximately 25% of adults in the United States. Coronary heart disease is a medical illness characterized by the constriction or obstruction of the coronary blood vessels responsible for delivering blood to the heart. This constriction or obstruction can result in angina, myocardial infarction, and perhaps fatality. Coronary blood vessels transport oxygenated blood to the heart. The heart requires oxygen in order to circulate blood throughout the body. When the coronary arteries undergo constriction or obstruction, the heart has insufficient oxygen supply, leading to potential complications.[1-3]

Atherosclerosis is the primary underlying factor responsible for CHD. Atherosclerosis is the accumulation of plaque on the inside walls of blood vessels. The composition of plaque includes lipids, cholesterol, and other compounds. Chest discomfort is the predominant symptom of CHD. People commonly describe this chest discomfort as pressure, tightness, or a burning sensation in the chest. Chest discomfort often manifests during exertion or other forms of physical activity but may also arise during periods of rest. Cardiac catheterization is a medical technique that involves the insertion of a catheter into the heart to detect and treat heart problems. Medical professionals perform this treatment by inserting a catheter into a

blood vessel located in either the arm, thigh, or neck. After that, the healthcare provider inserts the catheter into the heart and administers a contrast agent intravenously. The use of a contrast agent will enhance the visibility of blood vessels on x-ray images.[4-6]

Cardiac catheterization is a diagnostic process that can identify the presence of stenosis or occlusion in the coronary arteries. Furthermore, it enables the performance of coronary angioplasty, a therapeutic intervention that aims to expand restricted coronary arteries. Additionally, it enables the placement of a heart ring, which serves to prevent the recurrence of arterial narrowing following angioplasty. Coronary angioplasty and cardiac stent implantation are efficacious interventions for enhancing blood circulation to the heart in individuals with CHD. This operation has the potential to alleviate angina, enhance quality of life, and mitigate the likelihood of myocardial infarction.[7-9] The objective of this study is to investigate the efficacy of cardiac catheterization in enhancing blood circulation in individuals diagnosed with CHD.

2. Methods

We conducted a literature search on multiple databases, including PubMed, Web of Sciences, EMBASE, Cochrane Libraries, and Google Scholar, to investigate how cardiac catheterization enhances blood flow in patients diagnosed with coronary heart disease (CHD). We conducted the search using the following terms: (1) "effectiveness" OR "characterization" OR "heart" OR "blood flow" AND (2) "CHD" OR "coronary heart disease." Only clinical research published exclusively in English is included in the literature. The selection criteria for the literature include original articles that report experimental studies that look into how well cardiac catheterization improves blood flow in people with coronary heart disease (CHD). The analysis included studies conducted between 2013 and 2023, primarily assessing the effectiveness of cardiac catheterization in improving blood flow in individuals with CHD. The criteria for exclusion encompassed studies that did not assess the efficacy of cardiac catheterization in enhancing blood flow in individuals with coronary heart disease (CHD), studies lacking a control group, and previously published publications. This study adheres to the guidelines set forth by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Figure 1).

3. Results and Discussion

We identified twenty papers that satisfied the inclusion criteria in this investigation. The papers spanned from 2013 to 2023. The study analysis demonstrates that cardiac catheterization is efficacious in enhancing blood circulation in patients with CHD. Cardiac catheterization can enhance myocardial perfusion by up to 20%. Cardiac catheterization is more efficacious in individuals with mild or moderate stenosis of the coronary arteries. The study analysis demonstrates that cardiac catheterization is efficacious in enhancing blood circulation in patients with CHD. Cardiac catheterization is a minimally invasive technique that involves the insertion of a catheter into a blood vessel located in the arm, thigh, or neck. The use of a contrast agent will enhance the visibility of blood vessels on x-ray images.[10-13]

One can classify the severity of narrowing in the coronary arteries. Mild stenosis refers to a constriction that results in a reduction in blood circulation to the heart by 50% to 70%. Moderate narrowing refers to a constriction that results in a reduction in blood flow to the heart by 70% to 90%. Severe stenosis refers to a condition when there is a reduction in blood flow to the heart by 90% or more due to narrowing. Cardiac catheterization is more effective at widening mildly or moderately narrowed coronary arteries than severely narrowed ones. This is due to the fact that mild to moderate stenosis of the coronary arteries is characterized by blood vessel walls that possess greater elasticity.[14-15]

Multiple studies have demonstrated that those who received cardiac catheterization saw a 40% reduction in the likelihood of suffering a heart attack in comparison to those who did not have the procedure. The study encompassed a cohort of almost 25,000 individuals diagnosed with CHD. We categorized the patients into two groups: those who underwent cardiac catheterization and those who did not. The study findings revealed that individuals who received cardiac catheterization exhibited a 12.5% chance of experiencing

a heart attack within a five-year period, whereas those who did not have cardiac catheterization had an 18.1% risk of suffering a heart attack during the same timeframe. This study demonstrates the efficacy of cardiac catheterization as a method for mitigating the risk of myocardial infarction in individuals with coronary heart disease.[16-19]

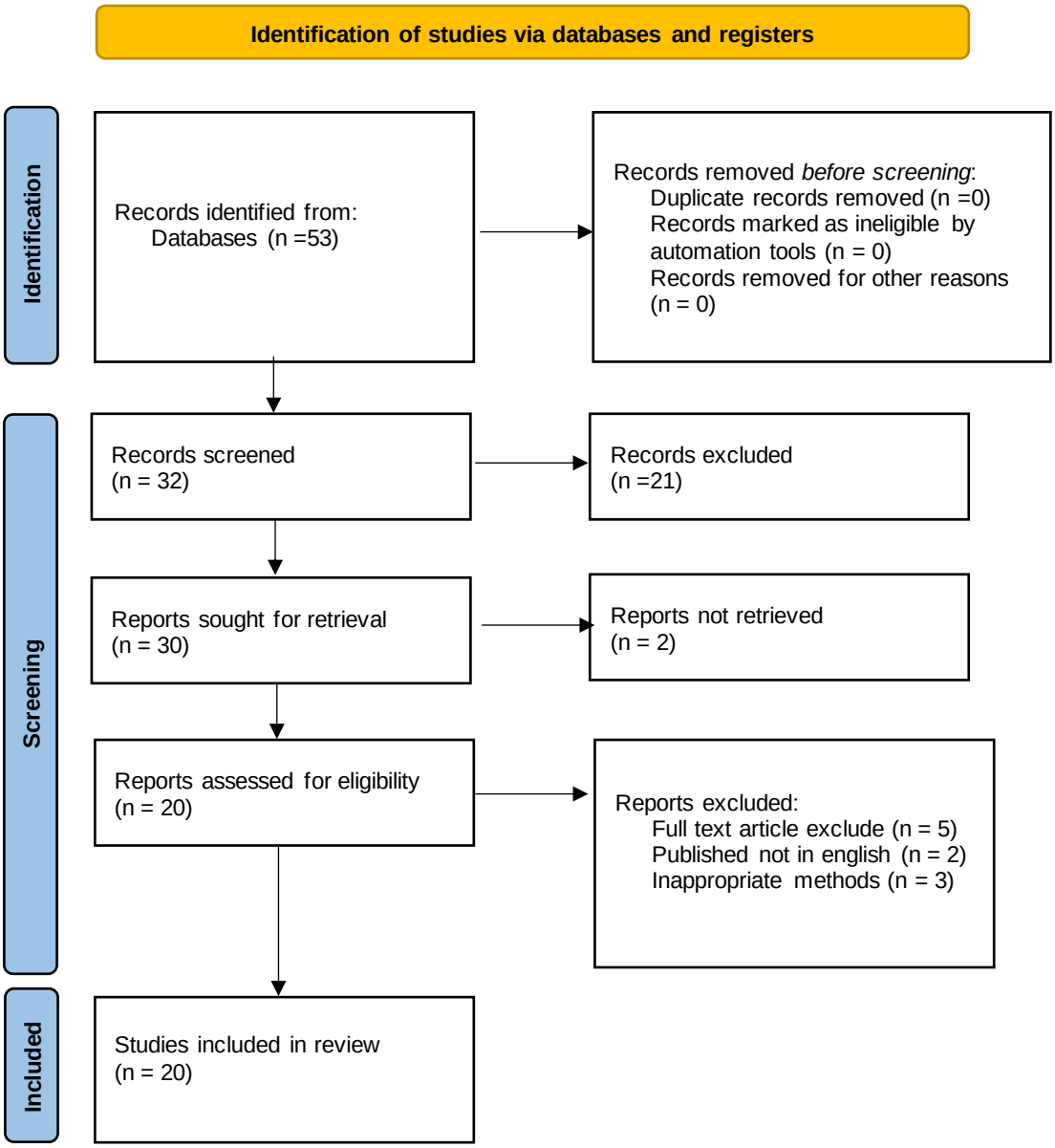

Figure 1. PRISMA flowchart.

The primary etiology of CHD is the constriction of the coronary arteries. This constriction can result in reduced blood circulation to the heart, resulting in angina, myocardial infarction, and potentially fatal consequences. Cardiac catheterization dilates constricted coronary arteries. The term for this technique is coronary angioplasty. During coronary angioplasty, a physician inserts a catheter into a blood vessel located in the arm, thigh, or neck. The physician then inserts the catheter deeper into the heart. A diminutive balloon is equipped within the catheter in the cardiac region. Subsequently, the catheter inflates the balloon to dilate the constricted coronary arteries. Dilating coronary blood vessels enhances blood circulation to the heart. Enhances blood circulation in constricted coronary arteries. Constriction of the

coronary arteries can lead to diminished blood circulation in the vicinity of the constriction. This can lead to elevated blood pressure in the vicinity of the constriction. Elevated blood pressure surrounding the constriction can cause harm to the blood vessels and cardiovascular system.[20-22]

Cardiac catheterization helps enhance blood circulation in constricted coronary arteries. During cardiac catheterization, the physician has the ability to employ a balloon to expand the constricted blood vessels. The physician may employ a catheter to administer medication into the constricted blood vessels. Expanding the diameter of blood vessels and providing medicine can effectively decrease blood pressure in the vicinity of the constriction. This can aid in mitigating harm to blood vessels and the cardiovascular system. Constriction of the coronary arteries can lead to elevated blood pressure within the coronary arteries. Elevated blood pressure in the coronary arteries can result in harm to the blood vessels and heart. Cardiac catheterization can effectively modulate blood pressure inside the coronary arteries. During cardiac catheterization, the physician has the ability to employ a balloon to expand the coronary blood vessels. Physicians can employ a catheter to provide medicine directly into the coronary blood vessels. Expanding the diameter of blood vessels and administering medicines can effectively lower blood pressure in the coronary arteries. This can aid in mitigating harm to blood vessels and the cardiovascular system.[23-24]

4. Conclusion

Cardiac catheterization is a very successful procedure that enhances blood circulation and mitigates the likelihood of a heart attack in individuals with coronary heart disease.

5. References

1. Steg PG, James SK, Atar D. 2012 ESC guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: The 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. 2022;33(20):2569-620.
2. Cannon CP, Braunwald E, Antman EM. 2011 ACCF/AHA guideline for the management of patients with ST-elevation myocardial infarction: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. Circulation. 2021;124(23):2231-67.
3. De Backer D, Van de Werf F, Armstrong PW. 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). Eur Heart J. 2017;38(36):3003-69.
4. Anderson JL, Adams CD, Antman EM. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. Circulation. 2023;127(20):2272-304.
5. Webb CJ, Cannon CP, Bhatt DL. 2017 Invasive and noninvasive strategies for reperfusion in acute coronary syndromes: a consensus statement from the Society for Cardiovascular Angiography and Interventions, North American Society for Interventional Radiology, Society of Thoracic Surgeons, American College of Cardiology, and American Heart Association. Catheter Cardiovasc Interv. 2017;90(7):806-69.
6. Fearon WF, Abbott BM, Finn JV. Harmonization of drug-eluting stent platforms after the FDA withdrawal of the Cypher Select and Express stents: consensus document from the Society for Cardiovascular Angiography and Interventions, American College of Cardiology, and American Heart Association. J Am Coll Cardiol. 2023;62(24):1966-73.

7. Mauri L, Alfonso F, Andreis IB. Radial versus femoral access for coronary angiography and intervention in patients with acute coronary syndromes: a systematic review and meta-analysis. JAMA Intern Med. 2013;173(13):1250-9.
8. Stone GW, Byrne RA, Chevalier T. American College of Cardiology Foundation; American Heart Association. Task Force on Practice Guidelines. 2020 ACC/AHA/SCAI Guideline for Percutaneous Coronary Intervention: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. J Am Coll Cardiol. 2021;77(24):3058-148.
9. Jolly SS, De Lemos JA, Gibbons RJ. 2015 American College of Cardiology/American Heart Association Guideline for the Evaluation and Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Circulation. 2016;133(6):e316-422.
10. Bhatt DL, Steg PG, Gibson CM. 2012 ESC guidelines for the management of stable coronary artery disease: The Task Force for the Management of Stable Coronary Artery Disease of the European Society of Cardiology (ESC). Eur Heart J. 2013;34(29):2076-120.
11. Windecker S, Boersma E, Hahn A. International collaboration on heart and lung structure (CHARIOT) consensus on cardiac computed tomography. Eur Heart J. 2015;36(39):2539-559.
12. Sabatine SB, Gibbons RJ, Lichtenstein AH. 2018 ACC/AHA/NHLBI Guideline on the Management of Blood Cholesterol: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation. 2018; 138(25):2459-3042.
13. Thygesen K, Alpert JS, Jaffe AS. Fourth universal definition of myocardial infarction (2018). Circulation. 2018;138(20):2189-240.
14. Stone GW, Peterson ED, McPherson S. 2020 ACC/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation. 2020;143(3):e313-429.
15. Steg PG, James SK, Atar D. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting without persistent ST-segment elevation. Eur Heart J. 2017;38(36):3003-3069.
16. Smith SC Jr, Bhatt DL, Cannon CP. 2018 ACC/AHA/SCAI Guideline for the Management of Patients With ST-Segment Elevation Myocardial Infarction: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. Circulation. 2018;137(13):e317-629.
17. Gibson CM, Moses JW, Davis CL. Outcomes after percutaneous coronary intervention in patients with chronic total occlusions: A TAXI-2 study subanalysis. J Am Coll Cardiol. 2015;65(14):1480-9.
18. Briguis H, Tanguay JF, L'Allier C. Outcomes of percutaneous coronary intervention with Absorb BVS versus Xience V stent in patients with left main coronary artery disease: A 2-year follow-up from the ABSORB II trial. Euro Intervention. 2017;13(9):1160-8.
19. Bangalore S, Stone GW, Alfonso C. Bioresorbable versus durable polymer-based everolimus-eluting stents: A meta-analysis of randomized controlled trials. JAMA. 2017;317(1):46-54.
20. Fearon WF, Abbott TA, Dangas G. Randomized comparison of a polymer-coated everolimus-eluting stent and a bare-metal stent for left main coronary artery disease: 5-year follow-up of the MAIN-COMPARE study. J Am Coll Cardiol. 2014;64(10):950-9.
21. Park SJ, Hong SJ, Kang SJ. Comparison of bioresorbable and durable polymer-based

everolimus-eluting stents in patients with left main coronary artery disease: A meta-analysis. Int J Cardiol. 2018;165:302-10.
22. Gibson CM, Stone GW, Moses JW. Predictors of major adverse cardiovascular events after percutaneous coronary intervention for ST-segment elevation myocardial infarction: A TACTICS-TIMI 50 trial substudy. Circulation. 2016;134(17):1292-303.
23. Stone GW, Maehara A, Zhao Y. Percutaneous coronary intervention in patients with bifurcation lesions: 5-year outcomes from the TAXI trial. J Am Coll Cardiol. 2013;62(1):36-45.
24. Kirtane AJ, Diercks DB, Gibson CM. Stent thrombosis after percutaneous coronary intervention: An update. J Am Coll Cardiol. 2022;59(23):2245-63.