Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.1136
*Biol. Clin. Sci. Res. J., Volume, **2024**: 1136*
Original Research Article

SUCCESS RATES OF THROMBECTOMY IN STEMI PATIENTS UNDERGOING PERCUTANEOUS CORONARY INTERVENTION

SAQI MAUR*, BUBAKAR M, FAROOQ M, ASHRAF MW, ASLAM M, FAROOQ F

Department of Cardiology, National institute of cardiovascular diseases Karachi, Pakistan
**Corresponding author`s email address:* atiqurerehman 39@yahoo.com

(Received, 04th August 2024, Revised 25th September 2024, Published 26th September 2024)

Abstract: *Percutaneous coronary intervention (PCI) is a standard treatment for ST-segment elevation myocardial infarction (STEMI) patients. The role of thrombectomy as an adjunct to PCI remains debated, with conflicting evidence regarding its benefits and associated risks.* ***Objective:*** *This study aimed to compare the outcomes of patients receiving PCI with and without thrombectomy in managing STEMI, evaluating key parameters such as mortality, re-infarction, heart failure, cardiogenic shock, renal dysfunction, bleeding complications, stroke, and hospital stay duration.* ***Methods:*** *This cross-sectional study included 100 patients who met the inclusion criteria. Patients were divided into two groups: Group A (n=50) underwent PCI alone, and Group B (n=50) received PCI with adjunctive thrombectomy. Outcomes were compared between the two groups, including mortality, re-infarction, cardiac failure, cardiogenic shock, renal dysfunction, bleeding complications, stroke, and hospital stay. Statistical analysis was performed using appropriate tests, with significance at $p < 0.05$.* ***Results:*** *Of the 100 patients, 62% were male, and 38% were female. The mean age of patients in Group A was 54.19 ± 12.62 years, while in Group B, it was 55.22 ± 13.51 years. The mean BMI in Group A was 25.5 ± 3.16 kg/m², compared to 24.35 ± 5.75 kg/m² in Group B. Diabetes was present in 54% of Group A and 44% of Group B, and a history of smoking was reported in 38% of Group A and 34% of Group B. There was no significant difference in mortality between the two groups. However, renal dysfunction occurred in 1 patient in Group A and five in Group B ($p = 0.03$). Heart failure was noted in 3 patients in Group A and 6 in Group B ($p = 0.002$). Significantly more cases of stroke, excessive bleeding, and renal dysfunction were observed in Group B (PCI with thrombectomy) compared to Group A.* ***Conclusion:*** *Patients undergoing PCI with thrombectomy were at higher risk of developing complications, including stroke, renal dysfunction, and heart failure, compared to those receiving PCI alone. Although there was no significant difference in mortality between the two groups, the increased risk of post-procedure complications in the thrombectomy group suggests that careful patient selection is crucial for optimizing outcomes.*

Keywords: PCI; STEMI; Thrombectomy; Outcomes; Renal Dysfunction; Stroke; Heart Failure; Mortality

Introduction

Whenever percutaneous coronary intervention (PCI) is appropriate, it is the most effective means of achieving reperfusion for individuals with ST-segment elevation myocardial infarction (STEMI) (1).But two significant disadvantages of PCI are the possibility of thrombus distal embolization and the inability to reestablish flow at the microvascular level (2).

The extent of ST-segment resolution or the magnitude of angiographic myocardial blush, two markers of microvascular tissue reperfusion, predicts the death rate after PCI. (3). The thrombus can be extracted manually before stent implantation to decrease distal embolization and improve microvascular perfusion. Minor, randomized investigations of thrombectomy have shown benefits in tissue reperfusion markers. (4).The primary result in terms of myocardial blush grade was enhanced in the Thrombus Aspiration during Percutaneous Coronary Intervention in Acute Myocardial Infarction Study (TAPAS), and thrombectomy was linked to a lower death rate (5). Following this, standard manual thrombectomy was

It is recommended in clinical practice. This has led to the quick rise in popularity of thrombectomy and its integration into clinical practice. Thrombus aspiration is thought to benefit patients who present early because observational analyses have shown that it is less beneficial for those who have had extended periods of ischemia. Some assert that individuals experiencing extended durations of ischemia possess organized thrombi, requiring and reaping more advantages from thrombus aspiration. (6).

The TOTAL (Thrombectomy with PCI vs. PCI Alone in Patients with STEMI) trial, which randomized 732 STEMI patients to undergo either PCI alone or preemptive thrombus aspiration with PCI, was prepared to address this problem. Overall, the TOTAL study discovered that there was no correlation between a decreased risk of the primary outcomes of cardiovascular mortality, myocardial infarction (MI), cardiogenic shock, or heart failure with manual thrombectomy followed by PCI compared to PCI alone. Instead, it was connected to an increased risk of stroke. (7). Nonetheless, two more significant randomized clinical trials, the TOTAL (Trial of Routine Aspiration Thrombectomy with PCI vs. PCI Alone in Patients with STEMI) and TASTE (Thrombus Aspiration in STEMI in Scandinavia) studies, failed to find any benefits of aspiration thrombectomy in reducing the risk of stent thrombosis, recurrent myocardial infarction, or general cardiovascular mortality. (8, 9).

[Citation Saqi, M.A.U.R., Bubakar, M., Farooq, M., Ashraf, M.W., Aslam, M., Farooq, F. (2024). Success rates of thrombectomy in stemi patients undergoing percutaneous coronary intervention. *Biol. Clin. Sci. Res. J.*, **2024***: 1136*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1136]

The present study aimed to evaluate the efficacy of thrombectomy followed by PCI in patients with acute STEMI by comparing its outcomes with those of patients with PCI alone.

Methodology

This cross-sectional investigation was conducted at NICVD Karachi, Pakistan, from December 2023 to May 2024 and comprised 100 cases of STEMI. The study comprised patients over 25 who had received Percutaneous Coronary Intervention (PCI) for ST-segment elevated myocardial infarction (STEMI). Only those patients who did not consent and required CABG were excluded from the study. The NICVD Karachi institutional review board and hospital ethical committee approved the study. This approach follows international standards, assuring the reliability and consistency of the study findings. The patient's complete demographic details, such as age, sex, place of residence, concurrent illnesses like diabetes mellitus, hypertension, a history of cigarette smoking and high cholesterol, history of liver and renal illness, and associated diseases, were studied.

We divided patients into two groups. Fifty patients in Group A underwent just PCI, whereas fifty patients in Group B received PCI with thrombectomy. The study evaluated the two groups in terms of mortality, re-infarction, cardiac failure, cardiogenic shock, renal dysfunction, bleeding complications, stroke, and hospital stay.

The data was analyzed with SPSS 21.0. A chi-square statistic and the student t-test were used to compare the findings of the two groups. Frequency and percentages were obtained to interpret the results in a tabular format. A P-value of 0.05 was deemed statistically significant.

Results

As shown in Figure 1, 62 (62%) of the study population were male patients, and 38 (38%) were females.

One hundred patients were enrolled in our study. Both groups were comparable in demographics, as shown in Table 1. The mean age of the study population in group A was 54.19±12.62 years, while in group B, it was 55.22±13.51 years. The mean BMI of the population in group A was 25.5±3.16 kg/m2, while in group B, it was 24.35±5.75 kg/m2 (Table 1).

54% of the study population in group A was diabetic, while 44% in group B. 38% of the study population of Group A had a smoking history, while 34% of the study population in Group B had a smoking history. Family history of IHD was provided by 26% of the participants in group A and 24% of the participants in group B.

Anterior wall MI was found in 54% of the study population in group A, while it was 50% in group B. Inferior wall MI was the second most common type in the study population, as shown in Table 2. Lateral wall MI was found in only 10% of the participants in Group A, while in 20% of the population in Group B (Figure 2). There was no significant difference in terms of mortality between the two groups. Only one patient developed renal dysfunction in group A, while five developed renal dysfunction in group B (P =0.03) (figure 3). Heart failure occurred in 3 people in group A, while it occurred in 6 people in group B (P=0.002). There were significantly more cases of renal dysfunction, stroke, heart failure, excessive bleeding, and renal infarction in group B compared to group A, as indicated by their corresponding p values (table 3).

Hospital stay was correspondingly longer in group B than in group A, with a p-value of 0.02 (Table 4).

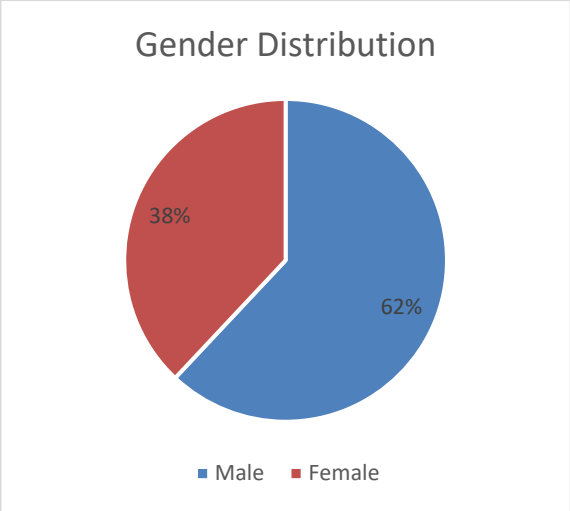

Figure 1 shows the gender distribution in the study population

Table 1: Patient demographics

Variable	Group A N=50 (n,%)	Group B N=50 (n,%)
Mean age (years)	54.19±12.62	55.22±13.51
Mean BMI (kg/m2)	25.5±3.16	24.35±5.75
Comorbidities		
Diabetes	27(54)	22(44)
Hypertension	14(28)	18(36)
hypercholesterolemia	11(22)	13(26)
Family history of IHD	13(26)	12(24)
Smoking history	19(38)	17(34)

Table 2: Type of MI

Variable	Group A N=50 (n,%)	Group B N=50 (n,%)
Anterior wall MI	27(54)	25(50)
Inferior wall MI	18(36)	15(30)
Lateral wall MI	5(10)	10(20)

[Citation Saqi, M.A.U.R., Bubakar, M., Farooq, M., Ashraf, M.W., Aslam, M., Farooq, F. (2024). Success rates of thrombectomy in stemi patients undergoing percutaneous coronary intervention. *Biol. Clin. Sci. Res. J.*, **2024***: 1136*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1136]

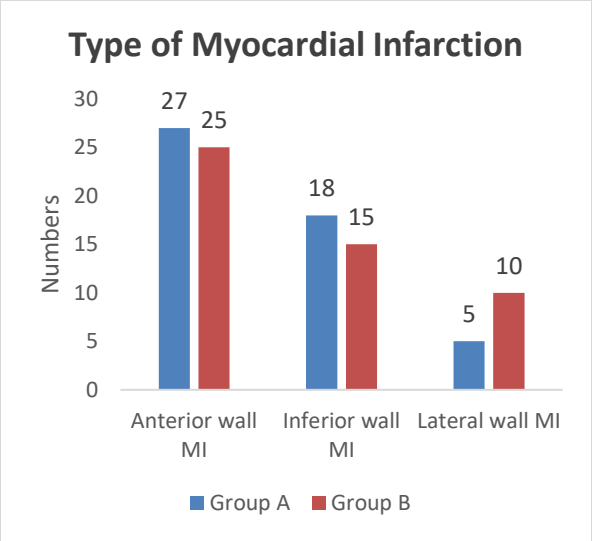

Figure 2 shows the frequency of different MI presented in the study population.

Table 3: Comparison of results between the two groups.

Variable	Group A	Group B	P value
Mortality	2(4)	3(6)	0.42
Renal dysfunction	1(2)	5(10)	0.03
Renal infarction	2(4)	5(10)	0.04
Stroke	1(2)	3(6)	0.01
Heart failure	3(6)	6(12)	0.002
Excessive bleeding	1(2)	2(4)	0.06

Table 4 Post-procedure hospitalisation across both groups

Variable	Group A	Group B	P value
Stay in hospital (days)	4.7±2.36	7.54±9.67	0.02

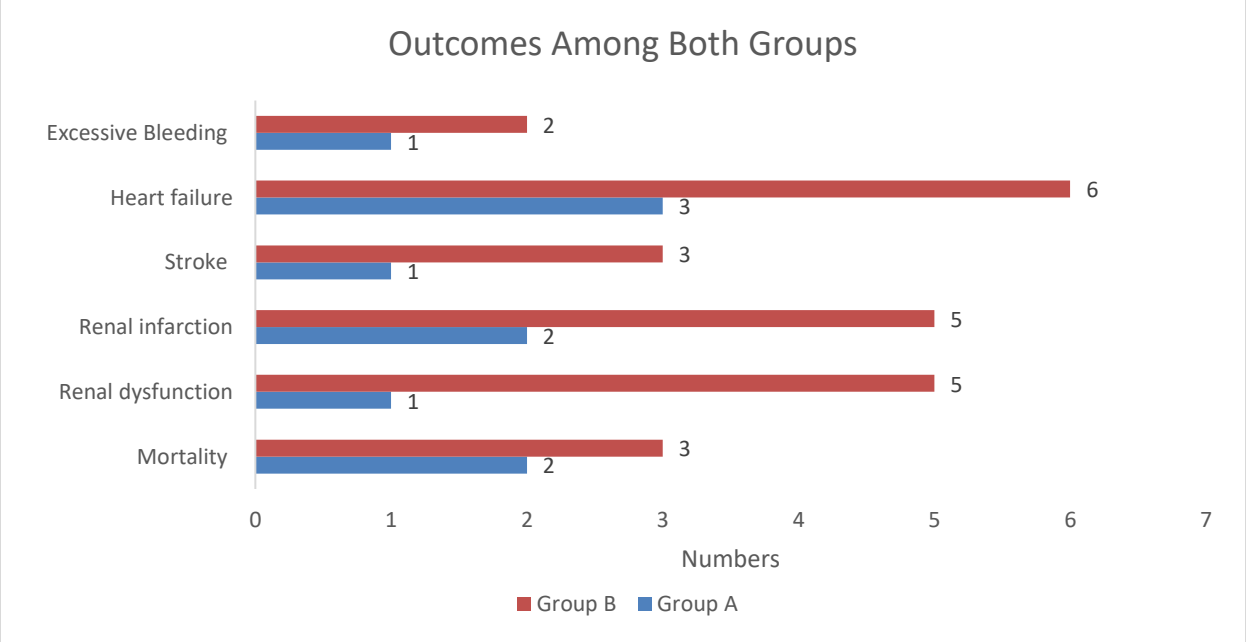

Figure 3 shows the outcomes among both groups.

Discussion

We investigated 100 individuals who had received PCI. Patients were divided into two groups, group A and group B. Patients in Group B had PCI with thrombectomy, whereas those in Group A received PCI. The mean age of the study population in group A was 54.19±12.62 years, whereas in group B it was 55.22±13.51 years. The mean BMI of the population in group A was 25.5±3.16 kg/m2, whereas in group B it was 24.35±5.75 kg/m2. These results are according to the results of the previous investigations (10). In group A, 54% of the study population had diabetes. , compared to 44% in group B. 38% of the study population in group A had a smoking history, compared to 34% in group B. A family history of IHD was reported by 26% of individuals in group A and 24% of participants in group B. These findings were consistent with earlier investigations (11). There was no significant difference in mortality rates between the two groups. These results are also based on the findings of the research conducted by Deng and his colleagues (12). Embolization of thrombus from the cardiac circulation to the systemic circulation may occur after thrombectomy (13), which is one reason for the increase in ischaemic stroke in group B. Furthermore, operators may have used more aggressive guide catheter manipulation to

adequately bridge lesions using the thrombectomy catheter, which might have displaced atheroma from the aorta. Also, the usual thrombectomy procedure times were longer. These mechanisms may explain strokes that occurred shortly after PCI and those that were ischaemic. A comprehensive scientific analysis indicated that the risk of stroke is most significant within 48 hours and then seems to decrease around 2 and 90 days (14). There is a propensity for further increased risk of stroke throughout the 90–180-day period following thrombectomy. The very late rise (90–180 days) has no explanation and might result from chance, whereas the early raised risk of stroke makes sense (15) (16).

It is generally claimed that mechanical methods have a higher death rate than manual ones and that patients with significant thrombus loads should get both mechanical techniques and myocardial perfusion measures as part of their therapy. (17). A new meta-analysis by Tamhane found that traditional PCI and PCI with thrombectomy did not significantly differ in one-month mortality, whereas manual devices improved myocardial perfusion indices. (18). Glycoprotein IIB/IIIA and balloon pre-dilatation were used in all of the individuals who needed thrombectomy because they commonly had complete coronary artery blockage and an enormous thrombus load. Because these patients exhibited greater no-reflow after thrombus aspiration and balloon pre-dilatation, they needed fewer stenting procedures. Hospital stay was correspondingly prolonged in group B than in group A, with a p-value of 0.02. These results are in accordance with the findings of the previous research (19).

Our study had many limitations that should be considered while interpreting these results. First, the small sample size limits the generalization of the findings. Second, the small sample size reduces the research's statistical significance. The research also has other limitations, including a lack of consideration for different complications in the study population.

Conclusion

Patients undergoing percutaneous coronary intervention (PCI) and thrombectomy were shown to be at a high risk of developing complications. There was no appreciable difference in mortality between the two groups. Nonetheless, there was an increased risk of post-procedure stroke and renal dysfunction in those who received thrombectomy.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-TCISB-234-23)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

MUHAMMAD ATTIQ UR REHMAN (Fellow Interventional Cardiology)
Coordination of collaborative efforts.
Study Design, Review of Literature.
MUHAMMAD ABUBAKAR (Fellow Interventional Cardiology)
Conception of Study, Development of Research Methodology Design, Study Design, manuscript Review
MUHAMMAD FAROOQ (Fellow Interventional Cardiology)
Manuscript revisions, critical input.
Coordination of collaborative efforts.
MUHAMMAD WASEEM ASHRAF (Fellow Interventional Cardiology)
Data acquisition and analysis.
Manuscript drafting.
MUHAMMAD ASLAM (Fellow Interventional Cardiology)
Data entry and data analysis, as well as drafting the article.
FAWAD FAROOQ (Professor of Cardiology)
Data acquisition and analysis.
Coordination of collaborative efforts.

References

1. Mughal LH, Sastry S. Advances in treating ST-elevation myocardial infarction in the UK. JRSM Cardiovascular Disease. 2022;11:20480040221075519.
2. Mathews SJ, Parikh SA, Wu W, Metzger DC, Chambers JW, Ghali MG, et al. Sustained mechanical aspiration thrombectomy for high thrombus burden coronary vessel occlusion: the multicenter CHEETAH study. Circulation: Cardiovascular Interventions. 2023;16(2):e012433.
3. Doherty DJ, Sykes R, Mangion K, Berry C. Predictors of microvascular reperfusion after myocardial infarction. Current Cardiology Reports. 2021;23:1-13.
4. De Luca G, Dudek D, Sardella G, Marino P, Chevalier B, Zijlstra F. Adjunctive manual thrombectomy improves myocardial perfusion and mortality in patients undergoing primary percutaneous coronary intervention for ST-elevation myocardial infarction: a meta-analysis of randomized trials. European heart journal. 2008;29(24):3002-10.
5. Svilaas T, van der Horst IC, Zijlstra F. Thrombus Aspiration during Percutaneous coronary intervention in Acute myocardial infarction Study (TAPAS)—study design. American heart journal. 2006;151(3):597. e1-. e7.
6. Luz A, Rodrigues P, Sousa MJ, Silveira I, Anjo D, Brochado B, et al. Thrombus aspiration for reperfusion in myocardial infarction: Predictors and clinical impact of

ineffectiveness. Revista Portuguesa de Cardiologia (English Edition). 2014;33(12):753-60.
7. Jolly SS, Cairns JA, Yusuf S, Rokoss MJ, Gao P, Meeks B, et al. Outcomes after thrombus aspiration for ST elevation myocardial infarction: 1-year follow-up of the prospective randomised TOTAL trial. The Lancet. 2016;387(10014):127-35.
8. Fröbert O, Lagerqvist B, Olivecrona GK, Omerovic E, Gudnason T, Maeng M, et al. Thrombus aspiration during ST-segment elevation myocardial infarction. New England Journal of Medicine. 2013;369(17):1587-97.
9. Svilaas T, Vlaar PJ, van der Horst IC, Diercks GF, de Smet BJ, van den Heuvel AF, et al. Thrombus aspiration during primary percutaneous coronary intervention. New England journal of medicine. 2008;358(6):557-67.
10. Sahami N, Akl E, Sanjanwala R, Shah AH. Safety and Efficacy of Low-Dose Intracoronary Thrombolysis During Primary Percutaneous Coronary Intervention in Patients with ST Elevation Myocardial Infarction: A Meta-Analysis of Randomized Trials. Current Problems in Cardiology. 2024:102616.
11. Jolly SS, Cairns JA, Yusuf S, Meeks B, Pogue J, Rokoss MJ, et al. Randomized trial of primary PCI with or without routine manual thrombectomy. New England Journal of Medicine. 2015;372(15):1389-98.
12. Deng S-B, Wang J, Xiao J, Wu L, Jing X-D, Yan Y-L, et al. Adjunctive manual thrombus aspiration during ST-segment elevation myocardial infarction: a meta-analysis of randomized controlled trials. PLoS One. 2014;9(11):e113481.
13. Jolugbo P, Ariëns RA. Thrombus composition and efficacy of thrombolysis and thrombectomy in acute ischemic stroke. Stroke. 2021;52(3):1131-42.
14. Shahjouei S, Sadighi A, Chaudhary D, Li J, Abedi V, Holland N, et al. A 5-decade analysis of incidence trends of ischemic stroke after transient ischemic attack: a systematic review and meta-analysis. JAMA neurology. 2021;78(1):77-87.
15. Köktürk U, Somuncu MU, Uygur B, Akgül Ö, Püşüroğlu H. Prognostic significance of thrombus burden on short-and long-term clinical outcomes in patients with ST-elevation myocardial infarction undergoing primary percutaneous coronary intervention. Coronary artery disease. 2022;33(7):559-65.
16. Watanabe T, Akasaka T, Kobara S, Yamamoto K. Successful visible thrombus aspiration in ST-segment elevation myocardial infarction: associated factors and the clinical impact. Coronary Artery Disease. 2022;33(6):479-84.
17. Stone GW, Maehara A, Witzenbichler B, Godlewski J, Parise H, Dambrink JH, et al. Intracoronary Abciximab and Aspiration Thrombectomy During Primary Pci For Anterior Stemi: One–Year Results from The Randomized Infuse–Ami Trial. Journal of the American College of Cardiology. 2013;61(10S):E1853-E.
18. Tamhane UU, Chetcuti S, Hameed I, Grossman PM, Moscucci M, Gurm HS. Safety and efficacy of thrombectomy in patients undergoing primary percutaneous coronary intervention for acute ST elevation MI: a meta-analysis of randomized controlled trials. BMC cardiovascular disorders. 2010;10:1-17.
19. Kumar D, Patra S, Pande A, Chakraborty R, Mukherjee SS, Roy RR, et al. Long-term clinical outcomes of thrombus aspiration in STEMI patients undergoing primary percutaneous coronary intervention. American Journal of Cardiovascular Disease. 2020;10(2):117.

.

[Citation Saqi, M.A.U.R., Bubakar, M., Farooq, M., Ashraf, M.W., Aslam, M., Farooq, F. (2024). Success rates of thrombectomy in stemi patients undergoing percutaneous coronary intervention. *Biol. Clin. Sci. Res. J.*, **2024***: 1136*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1136]