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ORIGINAL ARTICLE

In Hospital Outcome of Patients with Acute St-Elevation Myocardial Infarction Requiring Temporary Pacemaker

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ABSTRACT

Background and Aim: Acute myocardial infarction is a serious public health concern around the globe and temporary pacing is required in a variety of myocardial infarction. The present study aimed to determine the in-hospital outcome of acute ST elevation myocardial infarction patients requiring a temporary pacemaker.

Patients and Methods: This descriptive cross-sectional study was carried out on 120 acute myocardial infarction patients in the Cardiology Unit of PIMS Hospital, Islamabad from January 2021 to March 2023. Each individual underwent chest X-ray, ECG and serum markers. A detailed physical history including age, gender, smoking history, occupation, ischemic heart disease, diabetes, and hypertension were noted in specific designed proforma.

Inclusion Criteria: Acute myocardial infarction patients who had chest pain, elevated serum markers, New onset ST Elevation and complete heart block on ECG and required pace maker during their hospitalization were enrolled.

Exclusion Crieteria: Complete Heart block due to CKD or electrolyte imbalance, beta blocker or calcium channel blocker overdose, congenital heart block were excluded from the study.

Results: The overall mean age was 52.64±6.8 years. The incidence of smokers, diabetes, and hypertension was 76 (63.3%), 56 (46.7%), and 52 (43.3%) respectively. The mean duration of symptom's onset during hospital admission was 7.9±3.8 hours. About 48 (40%) patients had implanted temporary pacemaker at presentation, 66 (55%) on first post MI day, and 6 (5%) on 2nd post MI day. The in-hospital mortality was 8.3% (n=10). The incidence of ventricular tachycardia, ventricular fibrillation, and asystole was 28.3% (n=34), 3.3% (n=4) and 1.7% (n=2) respectively.

Conclusion: The present study found that complete heart block is associated with a poorer early prognosis in individuals with ST-Elevation MI who require temporary pacemaker. In these individuals, a more intensive therapy strategy targeted at reducing early death is required.

Keywords: Acute myocardial infarction, in-hospital outcome, temporary pace maker

INTRODUCTION

Acute STEMI is the worst form of coronary artery disease (CAD), with extremely significant mortality and morbidity [1]. A patient with significant ST-segment elevation may benefit from reperfusion treatment (pharmacologic or catheter-based) to restore blood flow in a blocked coronary artery. Primary PCI is defined as an intervention of the blocked infarct-related coronary artery performed within 12 hours of the onset of symptoms and without preceding fibrinolytic therapy [2]. In patients with acute STEMI, primary PCI is an effective and preferred form of emergency revascularization. In the modern period, research shows that revascularization with primary PCI resulted in better outcomes than thrombolysis [3]. When compared to thrombolysis, it resulted in earlier and more lasting reperfusion with fewer complications [4]. Furthermore, it dramatically lowers the incidence of re-infarction, death, and stroke [5]. Despite innovative advancement in detection and care, Acute myocardial infarction remains a serious problem [6]. Temporary artificial pacing is a public health issue in poor countries [7]. Cardiovascular disease is the leading cause of mortality globally [8].

Though various techniques for temporary cardiac pacing includes transesophageal and transcutaneous, but the transvenous is the mostly used technique that involve electrode implantation and peripheral venous puncture in the right side chambers. Pacing of this sort has been utilised since the 1960s, when it was initially used in patients with persistent arrhythmias [9]. Temporary artificial pacing is recommended in a variety of conditions, most notably in individuals with severe bradyarrhythmia (second- or third-degree atrioventricular block or severe symptomatic bradycardia) [10, 11]. Atropine can treat bradyarrhythmias that occur within the first several hours following an Acute Inferior wall MI. The incidence of second or third degree heart block in inferior MI might be 28%. The increasing mortality and poor in-hospital outcomes has been associated with complete heart block. The complete heart block associated mortality are significantly related with mortality risk in anterior myocardial infarction. The higher mortality rate is mostly due to progressive pump failure caused by severe myocardial necrosis [12, 13]. Acute myocardial infarction mortality has previously been exAcute myocardial infarctionned in previous studies conducted in Pakistan [14, 15].

METHODOLOGY

This descriptive cross-sectional study was conducted on 120 acute myocardial infarction patients in the Cardiology Unit of PIMS Hospital, Islamabad from January 2021 to December 2022. All the Acute myocardial infarction patients who had chest pain, elevated serum markers, typical variation in ECG, and required pace maker during their hospitalization were enrolled. Each individual underwent chest X-ray, ECG and serum biomarkers. A detailed physical history included age, gender, smoking history, occupation, ischemic heart disease, diabetes, and hypertension were recorded on specific designed proforma. Patients with 2nd or 3rd degree AV block, systolic blood pressure <90 mm Hg, symptomatic bradycardia, and ST elevation myocardial infarction were different eligibility criteria. The time between symptoms onset and admission in hospital was recorded. A thorough physical exAcute myocardial infarctionnation along with blood pressure, congestive heart failure, pulse, and precordial exAcute myocardial infarctionnation were done. A temporary pacemaker was inserted based on ECG's indications and patient's clinical state. Prior to pacemaker placement, all patients received intravenous injections of atropine (3 mg) divided doses to restore sinus rhythm. All patients had thorough transthoracic echocardiography throughout their hospital stay. Each patient's duration of pacemaker dependency was recorded. Individual patient hospitalization was also recorded.

In patients with acute ST elevation myocardial infarction, the in-hospital outcome included mortality and mechanical complications such as ventricular septal rupture, mitral

regurgitation, left ventricular pump failure, and ventricular aneurysm or pseudoaneurysm, as well as electrical complications such as ventricular tachycardia and ventricular fibrillation or asystole. SPSS version 27 was used for data analysis. Continuous variables were expressed as mean and standard deviation whereas categorical variables were described as frequency and percentages.

RESULTS

The overall mean age was 52.64±6.8 years. About 98 (81.7%) patients were male whereas 22 (18.3%) were female. The incidence of smokers, diabetes, and hypertension was 76 (63.3%), 56 (46.7%), and 52 (43.3%) respectively. The mean duration of symptom's onset during hospital admission was 7.9±3.8 hours. The incidence of inferior wall myocardial infarction (IWMI), IWMI with right ventricular MI, Extensive anterior wall myocardial infarction (AWMI), and anteroseptal wall MI 65% (n=78), 4.2% (n=5), 24.1% (n=29), and 6.7% (n=8) respectively. About 48 (40%) patients had implanted a temporary pacemaker at presentation, 22 (55%) on the first post MI day, and 18 (35%) on 2nd post MI day. The in-hospital mortality was 8.3% (n=10). The incidence of ventricular tachycardia, ventricular fibrillation, and asystole was 28.3% (n=34), 3.3% (n=4) and 1.7% (n=2) respectively. Baseline characteristics and laboratory parameters are shown in Table-I. Various comorbidities are shown in Figure-1. During admission, the incidence of heart blocks are shown in Table-II. In-hospital outcomes are shown in Table-III. Time of pacemaker implantation is shown in Table-IV.

Table-1: Baseline characteristics and laboratory parameters

Parameters	Value
Age (years)	52.64±6.8
Gender N (%) Male Female	 98 (81.7) 22 (18.3)
Duration of onset of symptoms (hours)	7.9±3.8
Serum creatinine	0.9 +0.6
Serum sodium	137.9 + 3.7
Serum potassium	3.9 + 0.4
Serum Urea	38 +18.6
Serum blood sugar	189 +102.4

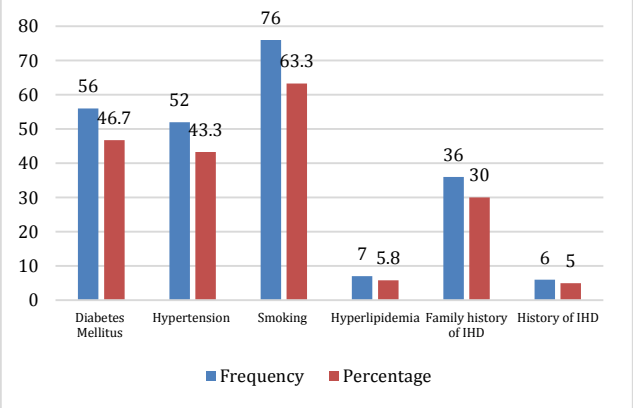

Figure-1: Comorbidities

Table-2: the incidence of heart blocks

Heart Block	N (%)
Complete heart block 1st post MI day	66 (55)
Complete heart block 2nd post MI day	6 (5)
TPM Dependency parameters 1 day 3 days 4 days 5 days 6 days	 3 (2.5) 3 (2.5) 18 (15) 66 (55) 20 (16.7)

Table-3: In-hospital outcomes

In-hospital outcome	N (%)
In-hospital mortality	10 (8.3)
Ventricular tachycardia	34 (28.3)
Ventricular fibrillation	4 (3.3)
Asystole	2 (1.7)
Left ventricular (LV) Normal Ejection fraction Mild systolic dysfunction Moderate systolic dysfunction Severe systolic dysfunction	 3 (2.5) 41 (34.2) 62 (51.7) 14 (11.7)

Table-4: Time of pacemaker implantation

Time (days)	Pacemaker implantation
Day 1	22 (55)
Day 2	18 (35)

DISCUSSION

The present study mainly focused on the determination of in-hospital outcome of acute myocardial infarction patients requiring temporary pacemaker and found that in individuals who have ST-Elevation myocardial infarction who require temporary pacing, complete heart block is associated with a poorer early diagnosis. Despite significant advances in treatment, Acute myocardial infarction remains a critical health related issue in less developed countries [16]. Anterior MI with complete heart block and inferior MI has been associated with in-hospital mortality. Irrespective of right bundle-branch block and left fascicular block, complete heart block with Acute myocardial infarction are significantly associated with higher mortality rate [17]. If there is accompanying PR prolongation, infarction patients of anterior and right bundle-branch block should be treated with pacemaker implantation [18].

MI in the inferior wall was more common than in the anterior wall. Streptokinase was utilised to treat thrombosis in 74% of the patients. During the hospital stay, 55% of patients experienced complete heart block on the first post-MI day, followed by 5% on the second post-MI day. About 48 (40%) patients implanted temporary pacemakers during their presentation out of which 55% on the first post-MI day, and 5% on the second post-MI day. Our findings are consistent with earlier research [19-21].

A prospective study of 9082 individuals found that Complete heart block occurred in 5% of Acute myocardial infarction patients. During the study period, the incidence rates of Complete heart block decreased. In patients with anterior or inferior/posterior MI, the incidence of Complete heart block decreased. These findings maintained after accounting for other variables that may influence the Complete heart block risk. Those who acquired Complete heart block had considerably higher mortality rates than those without Complete heart block (46.8% vs 14.6%) [22].

Ibánez et al [23] investigated the prevalence of various abnormalities and impact on prognosis in a large sequential cohort of Acute myocardial infarction patients, with thrombolytic treatment administered to more than 70% of patients. Conduction faults at various locations were investigated. Atrioventricular node block in majority cases occurred in inferior infarction whereas bundle branches block are related to the anterior infarction.

The significant failure of left ventricular, septal perfusion interruption, and significant myocardial injury are substantially associated with anterior Acute myocardial infarction complications caused by complete heart block [24]. Complete heart block in inferior Acute myocardial infarction frequently affects the supra-Hissian atrioventricular junction due to hypoperfusion of the atrioventricular nodal artery. Reperfusion of the infarct-related artery may lessen the occurrence of total cardiac block in both anterior and inferior infarctions. The effective reperfusion can be indicated with complete heart block vagally in a potential mechanism [25]. This is due to the restoration of flow, which allows leukocytes to migrate to the infarcted region and stimulates vagal innervation inside the infarcted myocardial.

CONCLUSION

Complete heart block is associated with a poorer early prognosis in individuals with ST-Elevation MI who require temporary pacemaker. In these individuals, a more intensive therapy strategy targeted at reducing early death is required.

REFERENCES

1. Ajmal L, Rahim T, Kundi A, Ashraf A. In-Hospital Outcome of Patients Requiring Temporary Transvenous Pacemaker After ST Elevation Myocardial Infarction. Pak Heart J. 2022;55(Supplement1):S23. https://doi.org/10.47144/phj.v55iSupplement1.2439.
2. Rashid S, Butt ZM, Khan MS, Afridi MS, Bhatti SM, Shahid M. Outcome of Primary Percutaneous Coronary Intervention Among Patients of Complete Atrioventricular Block with Acute Inferior St-Elevation Myocardial Infarction. Pakistan Journal of Medical & Health Sciences. 2022;16(11):789-.
3. Acute myocardial infarctionn AP, Spertus JA, Curtis JP, et al. The evolving landscape of impella use in the united states among patients undergoing percutaneous coronary intervention with mechanical circulatory support. Circulation 2020; 141: 273–284
4. Dhruva SS, Ross JS, Mortazavi BJ, et al. Association of use of an intravascular microaxial left ventricular assist device vs intra-aortic balloon pump with in-hospital mortality and major bleeding among patients with acute myocardial infarction complicated by cardiogenic shock. JAMA 2020; 323: 734–745.
5. Okşen D, SARILAR M, Demirci G, Haberal İ, ABACI O. In-Hospital and Long-Term Outcomes of ST-Segment Elevation Myocardial Infarction Patients Undergoing Primary Percutaneous Coronary Intervention. Koşuyolu Heart Journal. 2022;25(1):23-32.
6. Razaq HU, Ali K. Association of Increased Neutrophil to Lymphocyte Ratio to in-Hospital Outcome of Acute anterior Myocardial Infarction Patients Subjected to Thrombolytic Therapy with Streptokinase. Journal of Saidu Medical College, Swat. 2022 Jun 14;12(2):79-85.
7. Koh HP, Md Redzuan A, Mohd Saffian S, Nagarajah JR, Ross NT, Hassan H. The outcomes of reperfusion therapy with streptokinase versus tenecteplase in ST-elevation myocardial infarction (STEMI): a propensity-matched retrospective analysis in an Asian population. International Journal of Clinical Pharmacy. 2022 Jun;44(3):641-50.
8. Wichian C, Morasert T, Nilmoje T, et al. Prevalence and predictors associated with in-hospital mortality in acute ST segment elevation myocardial infarction after reperfusion therapy in developing country. Cardiovasc Diagn Ther. 2020;10:1264–9. https://doi.org/10.21037/cdt-20-398.
9. Jinatongthai P, Kongwatcharapong J, Foo CY, et al. Comparative efficacy and safety of reperfusion therapy with fibrinolytic agents in patients with ST-segment elevation myocardial infarction: a systematic review and network meta-analysis. Lancet. 2017;390:747–59. https://doi.org/10.1016/S0140-6736(17)31441-1.
10. Tourani S, Bashzar S, Nikfar S, et al. Effectiveness of tenecteplase versus streptokinase in treatment of acute myocardial infarction: a meta-analysis. Tehran Univ Med J. 2018;76(6):380–7.
11. Aherrao N, Chopda M, Gulecha V, et al. A randomized, parallel study to compare efficacy & safety of streptokinase vs tenecteplase when given in correct timelines in patients of ST-elevation myocardial infarction (STEMI). Ann Pharmacol Pharm. 2018;3(5):1159.
12. Neela B, Gunreddy VR, Chandupatla MR, et al. Safety and efficacy of streptokinase, tenecteplase, and reteplase in patients diagnosed with ST-elevation myocardial infarction: a comparative study. J Indian Coll Cardiol. 2020;10(3):134–8.
13. ChandraBabu S, Chakka G, Dornadula GRS, et al. Comparison of safety and efficacy of streptokinase and tenecteplase in patients of myocardial infarction. IOSR J Dent Med Sci. 2019;18(1):14–8.
14. Deshani VR, Mehta MN, Rathod NR. A comparative study of streptokinase v/s tenecteplase in hyper acute stage of myocardial infarction. Int J Sci Res. 2016;5(7):496–7.
15. Hossein Yazdi A, Khalilipur E, Zahedmehr A, et al. Fibrinolytic therapy with streptokinase vs tenecteplase for patients With ST-elevation MI not amenable to primary PCI. Iran Hear J. 2017;18(2):43–9.
16. Šerpytis P, Bilkis V, Kakliorius R, et al. Treatment of acute STEMI with thrombolysis: tenecteplase vs. streptokinase. Sveik Moksl. 2012;22(5):110–3.
17. Bawaskar H, Bawaskar P, Bawaskar P. Preintensive care: Thrombolytic (streptokinase or tenecteplase) in ST elevated acute myocardial infarction at peripheral hospital. J Fam Med Prim Care. 2019;8:62.
18. Chau HW, Choi KK. Efficacy and safety of tenecteplase versus streptokinase in treating ST-elevation myocardial infarction patients in Hong Kong: a four-year retrospective review in Queen Elizabeth Hospital. Hong Kong J Emerg Med. 2013;20(6):359–63. https://doi.org/10.1177/102490791302000605.
19. Ng SS, Lim TH, Tan SP, et al. Comparison of efficacy and safety of streptokinase and tenecteplase in patients with ST-segment elevated acute myocardial infarction (STEMI) in Melaka Hospital. In: Proceedings of the 9th national pharmacy R&D conference, 2016. Malaysian J Pharm. 2016;2:26.
20. Ko ATY, Teo Y, Teo HG, et al. Factors and outcomes associated with streptokinase-related hypotension in patients with ST segment elevation myocardial infarction (STEMI) in a secondary care hospital in Malaysia. Int J Cardiol. 2019;297:16–7. https://doi.org/10.1016/j.ijcard.2019.11.045.
21. Karam N, Bataille S, Marijon E, et al. Incidence, mortality, and outcome-predictors of sudden cardiac arrest complicating myocardial infarction prior to hospital admission. Circ Cardiovasc Interv. 2019.
22. Srimahachota S, Boonyaratavej S, Kanjanavanit R, et al. Thai Registry in Acute Coronary Syndrome (TRACS)-an extension of Thai Acute Coronary Syndrome Registry (TACS) group: lower in-hospital but still high mortality at one-year. J Med Assoc Thai 2012;98.
23. Ibánez B, James S, Agewall S, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. Rev Esp Cardiol (Engl Ed) 2017; 70; 1082.
24. Miyachi H, Takagi A, Miyauchi K, et al. Current characteristics and management of ST elevation and non-ST elevation myocardial infarction in the Tokyo metropolitan area: from the Tokyo CCU network registered cohort. Heart Vessels 2016;31:1740-51.
25. Wang R, Mei B, Liao X, et al. Determination of risk factors affecting the in-hospital prognosis of patients with acute ST segment elevation myocardial infarction after percutaneous coronary intervention. BMC Cardiovasc Disord 2017;17:243.