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Original research article

IN HOSPITAL OUTCOMES OF PATIENTS WITH ACUTE ST ELEVATION MYOCARDIAL INFARCTION NEEDED TEMPORARY PACEMAKER

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Abstract: *Patients with acute ST-elevation myocardial infarction (STEMI) are at risk for conduction abnormalities and bradyarrhythmias, which may necessitate the use of a temporary pacemaker (TP). While TPs can stabilize patients, in-hospital outcomes, particularly mortality and arrhythmic complications, remain concerns. Understanding these outcomes in STEMI patients requiring TP can provide insights into timely interventions and guide clinical management.* ***Objective:*** *.To evaluate the in-hospital outcomes of patients with acute ST-elevation myocardial infarction (STEMI) requiring temporary pacemaker (TP) insertion, examine patient demographics, clinical presentation, laboratory parameters, timing of pacemaker intervention, and associated complications.* ***Methods:*** *This cross-sectional study included 90 patients with confirmed STEMI, treated in the cardiology department of a tertiary care hospital. Patients were eligible if they presented with acute STEMI and required TP due to conduction abnormalities or bradyarrhythmias unresponsive to pharmacological therapy. In-hospital outcomes, including mortality and arrhythmic complications (ventricular tachycardia, ventricular fibrillation, asystole) were recorded.* ***Results:*** *The mean age was 51.14 ± 6.18 years, with a predominance of males (64.4%). TP was inserted at presentation in 47.8% of patients and on the first post-MI day in 52.2%. In-hospital mortality occurred in 7.8% of cases, while ventricular tachycardia, ventricular fibrillation, and asystole were observed in 27.8%, 5.6%, and 2.2% of patients, respectively.* ***Conclusion:*** *Patients with STEMI requiring TP have substantial in-hospital mortality and a high rate of arrhythmic complications, particularly ventricular tachycardia. The findings underscore the importance of early intervention in cases with high risk of conduction abnormalities, emphasizing the value of TP in managing unstable STEMI cases.*

Keywords: ST-elevation myocardial infarction, temporary pacemaker, in-hospital outcomes, ventricular tachycardia, arrhythmia, mortality, conduction abnormalities.

Introduction

Acute ST-elevation myocardial infarction (STEMI) represents one of the most severe forms of heart attack, characterized by the abrupt occlusion of a coronary artery, leading to a significant and immediate reduction in blood flow to the heart muscle. A significant percentage of instances of acute coronary syndrome (ACS) are caused by STEMI, which is frequently linked to high rates of morbidity and mortality (1, 2). Usually manifesting as a medical emergency, it necessitates prompt medical attention, including reperfusion therapy to minimize myocardial damage and restore coronary blood flow. Primary percutaneous coronary intervention (PCI), the gold standard for treating STEMI, attempts to unblock the blocked coronary artery in order to preserve as much viable myocardial tissue as feasible (3, 4).

But even with prompt reperfusion treatment, patients with STEMI may have a number of side effects that make their clinical trajectory more challenging. The emergence of cardiac electrical anomalies, which can result in conduction abnormalities like bradycardia or heart block, is one such consequence (5). Myocardial ischemia, which harms the heart's conduction system, frequently results in these electrical abnormalities. A temporary pacemaker may need to be inserted in order to maintain a suitable heart rate and guarantee appropriate cardiac output in some situations where the resulting arrhythmias or conduction abnormalities could be fatal. Usually, temporary pacing is used as a stopgap measure until the heart heals from ischaemic damage or until the necessity of permanent pacing is determined (6, 7).

The care of the patient becomes more complicated when a temporary pacemaker is required in the context of STEMI. It not only indicates how severe the myocardial damage is, but it also raises concerns about the patient's short-term prognosis, course of treatment, and chances for long-term recovery. A temporary pacemaker usually necessitates more frequent monitoring and may be linked to a number of problems, such as infection, mechanical failure, or additional arrhythmias. A pacemaker may also lengthen hospital stays and have an impact on overall hospital outcomes, including readmission rates, mortality rates, and recovery times (8-12).

The in hospital outcomes of patients with Acute ST-Elevation Myocardial Infarction (STEMI) who require a temporary pacemaker continue to be of critical interest. Although temporary pacemaker implantation is a proven treatment for bradycardia and life-threatening arrhythmias in STEMI, nothing is known about how it affects short-term outcomes. This research will improve clinical decision-

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making in the acute setting and optimize management strategies for this high-risk patient population by identifying critical factors that impact hospital course and patient prognosis.

Methodology

This cross-sectional study was conducted at the department of cardiology from July 2023 to July 2024 after taking ethical approval from the hospital. The study involved a total of 90 patients diagnosed with STEMI and treated in the cardiology department of a tertiary care hospital.

Patients were eligible for inclusion if they presented with acute STEMI confirmed by clinical presentation, electrocardiographic changes (significant ST-segment elevation), and elevated cardiac biomarkers. Additionally, patients were included if they required TP during their hospital stay due to conduction abnormalities, such as complete heart block, or bradyarrhythmias not responsive to pharmacological therapy. Patients with STEMI related to non-coronary causes, such as electrolyte imbalances, beta-blocker overdose, or those requiring permanent pacemakers, were excluded. Patients with incomplete medical records were also excluded to ensure data consistency. Data were collected using a structured proforma, including demographic information (age, gender), clinical characteristics (history of smoking, diabetes, hypertension), type of MI (inferior or anterior), and laboratory parameters (serum creatinine, sodium, and potassium levels). The time from symptom onset to hospital admission was recorded, as well as the timing of TP implantation (at presentation or on the first post-MI day). Outcomes of interest included in-hospital mortality and the occurrence of arrhythmic complications, such as ventricular tachycardia, ventricular fibrillation, and asystole.

SPSS 24 was used to analyze the data. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages.

Results

The study population had an average age of 51.14 ± 6.18 years, ranging from 36 to 64 years. Regarding gender distribution, 58 patients (64.4%) were male, while 32 patients (35.6%) were female. A history of smoking was reported in 21 patients (23.3%), with the remaining 69 patients (76.7%) being non-smokers. Diabetes mellitus was present in 37 patients (41.1%), whereas 53 patients (58.9%) had no history of diabetes. Hypertension was recorded in 44 patients (48.9%), and 46 patients (51.1%) had no hypertension history. Among the myocardial infarction cases, 62 patients (68.9%) experienced an Inferior MI, while 28 patients (31.1%) presented with an Anterior MI. The duration from symptom onset to hospital admission averaged 7.24 ± 3.49 hours, with a minimum of 0 and a maximum of 15 hours. The mean serum creatinine level was 0.84 ± 0.39 mg/dL, serum sodium levels averaged 137.89 ± 3.54 mEq/L, and serum potassium levels were 3.96 ± 0.42 mEq/L. Temporary pacemakers were implanted at presentation for 43 patients (47.8%) and on the first post-MI day for 47 patients (52.2%). In terms of in-hospital mortality, 7 patients (7.8%) did not survive, while 83 patients (92.2%) survived their hospital stay. Ventricular tachycardia occurred in 25 patients (27.8%), and 65 patients (72.2%) had no ventricular tachycardia. Ventricular fibrillation was documented in 5 patients (5.6%), with the vast majority, 85 patients (94.4%), experiencing no such episodes. Asystole was observed in 2 patients (2.2%), while 88 patients (97.8%) had no asystolic events during their hospital stay.

Table 1 Demographics and baseline presentation

Demographics and baseline presentation		Frequency	Percentage
Gender	Male	58	64.4%
	Female	32	35.6%
Smoking	Yes	21	23.3%
	No	69	76.7%
Diabetes	Yes	37	41.1%
	No	53	58.9%
Hypertension	Yes	44	48.9%
	No	46	51.1%
Clinical presentation	Inferior MI	62	68.9%
	Anterior MI	28	31.1%

Table 2 Laboratory parameters

Laboratory parameters	Mean	Std. Deviation
Symptom Onset Duration (hours)	7.24	3.488
Serum Creatinine (mg/dL)	.84	.394
Serum Sodium (mEq/L)	137.89	3.543
Serum Potassium (mEq/L)	3.96	.422

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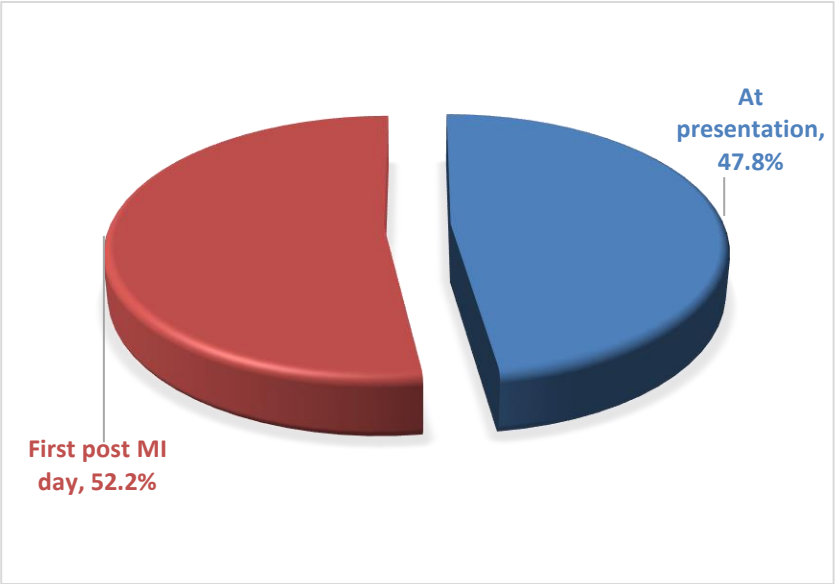

Figure 1 Timing to temporary pacemaker

Table 3 In hospital outcome and complications

In hospital outcome and complications		Frequency	Percentage
In-hospital Mortality	Yes	7	7.8%
	No	83	92.2%
Ventricular Tachycardia	Yes	25	27.8%
	No	65	72.2%
Ventricular Fibrillation	Yes	5	5.6%
	No	85	94.4%
Asystole	Yes	2	2.2%
	No	88	97.8%

Discussion

The average age of the study population was 51.14 ± 6.18 years, which is comparable to the study by Khalil M et al., who reported a mean age of 52.64 ± 6.8 years in a similar patient population requiring temporary pacemakers for STEMI. (13) Additionally, Javaid A et al. noted a slightly younger mean age of 49.9 ± 7.5 years in their study population, indicating that middle-aged adults are frequently affected by myocardial infarction requiring temporary pacing support. (14) This consistency in age distribution across studies suggests that the risk of STEMI with complications requiring pacing may peak in middle-aged adults, underlining the importance of preventive strategies in this demographic.

Gender distribution in the present study showed a predominance of males (64.4%), which is supported by previous studies indicating a higher prevalence of myocardial infarction among males in this context. For instance, Khalil M et al. reported that 81.7% of their patients were male (13), while Javaid A et al. found that 85% were male, reflecting a similar gender bias towards males in the occurrence of STEMI events requiring temporary pacing (14). This pattern is consistent with general observations in cardiology, where men tend to present with acute coronary syndromes more frequently than women, particularly in middle-aged groups.

Smoking prevalence in the current study was reported as 23.3%, which is lower than in other studies. For instance, Javaid et al. found that 66% of their study participants were smokers, suggesting that smoking may play a significant role in precipitating STEMI, particularly when combined with other risk factors such as hypertension and diabetes.14 In the present study, 41.1% of patients had diabetes, and 48.9% had hypertension, which aligns with the findings of Khalil M et al. who reported diabetes in 46.7% of their cases and hypertension in 43.3%.13 Javaid A et al. also found similar rates, with diabetes and hypertension present in 45% of patients.14 This similarity across studies indicates that comorbid conditions, particularly diabetes and hypertension, are common in patients presenting with STEMI and are likely significant contributors to the increased risk of severe complications requiring temporary pacemaker insertion.

In terms of clinical presentation, the prevalence of inferior MI in the present study was 68.9%, while anterior MI was noted in 31.1%. This trend aligns closely with Javaid A et al., who reported 65% inferior MI and 25% anterior MI. (14) In both studies, inferior MI was more common, which is of clinical relevance as the type of MI can influence the risk of complications, including arrhythmias and conduction abnormalities. Khalil M et al. also documented a higher incidence of inferior MI, indicating a possible predisposition to conduction disturbances in this infarct location, which may necessitate the use of a temporary pacemaker. (13) The dominance of inferior MI in these cases might also reflect the distinct pathophysiology of

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STEMI in different coronary territories and the associated risks of conduction blocks.

Laboratory parameters in the present study were generally in line with prior findings. Serum creatinine levels were observed at 0.84 ± 0.39 mg/dL, comparable to Khalil M et al., who reported 0.9 ± 0.6 mg/dL, and Javaid et al., who noted a similar range, suggesting renal function stability in these patients despite the presence of acute cardiac stress. (13, 14) Serum sodium and potassium levels were also consistent across studies, with values of 137.89 ± 3.54 mEq/L for sodium and 3.96 ± 0.42 mEq/L for potassium in the present study, mirroring levels in comparable studies. Stable electrolyte levels in these patients may indicate effective management of electrolytes as part of the acute care for myocardial infarction patients.

The timing of TP implantation is a critical factor for patient outcomes. In this study, 47.8% of patients received a TP at presentation, and 52.2% on the first post-MI day, closely matching Javaid A et al.'s findings where 40% received it at presentation, 57% on the first post-MI day, and a small number on the second day. (14) These similarities suggest a pattern of early intervention with TPs in STEMI patients presenting with high-degree AV blocks or severe bradyarrhythmias, aligning with clinical guidelines that emphasize early pacing in unstable cases to prevent further deterioration. Additionally, these findings highlight the utility of TP insertion in patients who develop complications immediately or shortly after MI onset, suggesting that rapid intervention may be crucial to managing such cases.

The in-hospital outcomes and complications further reflect significant trends observed in similar studies. In-hospital mortality was recorded at 7.8%, comparable to Javaid A et al., who reported an 8% mortality rate, while Khalil M et al. observed a similar mortality rate of 8.3%. (13) Ventricular tachycardia (VT) occurred in 27.8% of patients in the present study, which is consistent with Javaid et al.'s findings of 29%, underscoring the high risk of arrhythmic complications in this patient population. Ventricular fibrillation (VF) was less common, observed in 5.6% of cases here, compared to 3.3% in Khalil et al. and 2% in Javaid A et al., indicating that VF is relatively rare but remains a life-threatening risk among STEMI patients requiring pacing. (14) Asystole was reported in only 2.2% of patients in this study, close to the 1.7% observed by Khalil et al., which further underscores the rarity of this extreme arrhythmic event. (13)

In summary, the findings from this study on STEMI patients requiring temporary pacing align closely with previous research, especially in terms of demographic and clinical characteristics, the timing of TP intervention, and the in-hospital outcomes associated with high-risk arrhythmic complications. These comparisons reinforce the role of early TP implantation in cases with conduction abnormalities or severe bradyarrhythmias, particularly in inferior MI cases, and highlight the recurring pattern of comorbid conditions like diabetes and hypertension among affected individuals.

Conclusion

Patients with STEMI requiring TP have substantial in-hospital mortality and a high rate of arrhythmic complications, particularly ventricular tachycardia. The findings underscore the importance of early intervention in cases with high risk of conduction abnormalities, emphasizing the value of TP in managing unstable STEMI cases.

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-KIMSD-0221/23)

Consent for publication

Approved

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Conflict of interest

The authors declared an absence of conflict of interest.

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Concept & Design of Study

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