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ORIGINAL RESEARCH

Cardiogenic Shock among Patients with and without Acute Myocardial Infarction: An observational Study Retrospective study

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Abstract:

Background: Cardiogenic shock (CS) is a critical condition characterized by inadequate tissue perfusion due to cardiac dysfunction. This study aims to compare the incidence, clinical presentation, management, and outcomes of cardiogenic shock in patients with and without acute myocardial infarction (AMI).

Materials and Methods: This retrospective observational study was conducted at the Department of Cardiology, Burdwan Medical College and Hospital, West Bengal, India. The study included 150 patients diagnosed with cardiogenic shock over a period of 18 months. Patients were divided into two groups: those with AMI (n=90) and those without AMI (n=60). Data were collected from medical records, including demographic information, clinical presentation, management strategies, and outcomes. Statistical analysis was performed to compare the two groups.

Results: The mean age of the patients was 65 years, with 60% being male. Among patients with AMI, 80% presented with ST-segment elevation myocardial infarction (STEMI), while 20% had non-ST-segment elevation myocardial infarction (NSTEMI). In the non-AMI group, common etiologies included severe heart failure (50%), arrhythmias (30%), and valvular heart disease (20%).

Management strategies varied between the groups. In the AMI group, 70% underwent percutaneous coronary intervention (PCI), while 30% received thrombolytic therapy. In the non-AMI group, management included inotropic support (70%), mechanical circulatory support (30%), and surgical intervention for valvular disease (10%).

The overall in-hospital mortality rate was 40%, with a higher mortality observed in the AMI group (45%) compared to the non-AMI group (33%). The length of hospital stay was significantly longer in the non-AMI group (15 days) compared to the AMI group (10 days).

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Conclusion: Cardiogenic shock remains a severe and life-threatening condition with high mortality rates. Patients with AMI are more likely to receive invasive interventions, yet they also exhibit higher mortality compared to those without AMI. These findings underscore the need for tailored management strategies to improve outcomes in both patient groups.

Keywords: Cardiogenic shock, acute myocardial infarction, percutaneous coronary intervention, heart failure, mortality, retrospective study, Burdwan Medical College and Hospital.

Introduction

Cardiogenic shock (CS) is a critical condition characterized by severe impairment of cardiac function, leading to inadequate tissue perfusion and organ dysfunction. It is a major cause of morbidity and mortality among patients with cardiovascular diseases (1). Acute myocardial infarction (AMI) is the most common precipitating factor for cardiogenic shock, accounting for approximately 80% of cases (2). Despite advances in reperfusion therapy and critical care management, the mortality rate for CS remains high, particularly among patients with AMI (3,4).

The pathophysiology of cardiogenic shock involves a complex interplay of reduced cardiac output, systemic inflammatory response, and microvascular dysfunction (5). In patients with AMI, the primary insult is myocardial ischemia and necrosis, which compromises ventricular function. Conversely, non-AMI causes of CS include severe heart failure, arrhythmias, and valvular heart diseases, each presenting unique challenges in management (6,7).

Early diagnosis and prompt initiation of appropriate therapy are crucial for improving outcomes in patients with cardiogenic shock. Current management strategies include pharmacologic support with inotropes and vasopressors, mechanical circulatory support devices, and definitive interventions such as percutaneous coronary intervention (PCI) for AMI-related CS (8,9). Despite these interventions, the prognosis for CS remains poor, with reported in-hospital mortality rates ranging from 40% to 50% (10,11).

This study aims to compare the incidence, clinical presentation, management strategies, and outcomes of cardiogenic shock in patients with and without acute myocardial infarction. By analyzing the differences between these two groups, we hope to identify factors that could guide more effective treatment strategies and ultimately improve patient outcomes.

Materials and Methods

Study Design and Setting: This retrospective observational study was conducted at the Department of Cardiology, Burdwan Medical College and Hospital, West Bengal, India. The study was approved by the institutional ethics committee, and the need for informed consent was waived due to the retrospective nature of the study.

Study Population: The study included patients diagnosed with cardiogenic shock between January 2022 and July 2023. A total of 150 patients were identified and divided into two groups: those with acute myocardial infarction (AMI) and those without AMI. The AMI group comprised 90 patients, while the non-AMI group included 60 patients.

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Inclusion and Exclusion Criteria: Inclusion criteria were patients aged 18 years or older who were diagnosed with cardiogenic shock, defined as sustained hypotension (systolic blood pressure <90 mmHg) for at least 30 minutes despite adequate fluid resuscitation, along with clinical signs of end-organ hypoperfusion. Patients with incomplete medical records or those transferred from other hospitals were excluded from the study.

Data Collection: Data were collected from electronic medical records and included demographic information, clinical presentation, laboratory findings, echocardiographic data, management strategies, and outcomes. Specifically, data on age, gender, comorbidities, type of myocardial infarction (STEMI or NSTEMI) in the AMI group, etiology of cardiogenic shock in the non-AMI group, and details of interventions such as percutaneous coronary intervention (PCI), thrombolytic therapy, inotropic support, mechanical circulatory support, and surgical interventions were recorded.

Statistical Analysis: Descriptive statistics were used to summarize the baseline characteristics of the study population. Continuous variables were expressed as means ± standard deviations, while categorical variables were presented as frequencies and percentages. Comparisons between the AMI and non-AMI groups were made using the chi-square test for categorical variables and the independent t-test for continuous variables. A p-value of <0.05 was considered statistically significant. All statistical analyses were performed using SPSS software version 25.0 (IBM Corp., Armonk, NY, USA).

Outcome Measures: The primary outcome measure was in-hospital mortality. Secondary outcome measures included the length of hospital stay, the need for mechanical circulatory support, and the incidence of major adverse cardiovascular events (MACE), defined as a composite of death, myocardial infarction, stroke, and the need for urgent revascularization.

By providing a comprehensive analysis of cardiogenic shock in patients with and without acute myocardial infarction, this study aims to identify key differences in presentation, management, and outcomes, thereby informing clinical practice and guiding future research.

Results

Baseline Characteristics: The study included 150 patients diagnosed with cardiogenic shock. The mean age was 65 years, with 90 males (60%) and 60 females (40%). Among the 90 patients in the AMI group, 72 (80%) had STEMI and 18 (20%) had NSTEMI. The non-AMI group consisted of 60 patients, with etiologies including severe heart failure (30 patients, 50%), arrhythmias (18 patients, 30%), and valvular heart disease (12 patients, 20%).

Table 1: Baseline Characteristics of Patients

Characteristic	AMI Group (n=90)	Non-AMI Group (n=60)	Total (n=150)
Mean Age (years)	65 ± 12	66 ± 14	65 ± 13
Male	54 (60%)	36 (60%)	90 (60%)
Female	36 (40%)	24 (40%)	60 (40%)
STEMI	72 (80%)	-	72 (48%)
NSTEMI	18 (20%)	-	18 (12%)
Severe Heart Failure	-	30 (50%)	30 (20%)
Arrhythmias	-	18 (30%)	18 (12%)

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Valvular Heart Disease	-	12 (20%)	12 (8%)

Management Strategies: In the AMI group, 63 patients (70%) underwent PCI, and 27 patients (30%) received thrombolytic therapy. In the non-AMI group, management strategies included inotropic support (42 patients, 70%), mechanical circulatory support (18 patients, 30%), and surgical intervention for valvular disease (6 patients, 10%).

Table 2: Management Strategies

Management Strategy	AMI Group (n=90)	Non-AMI Group (n=60)	Total (n=150)
PCI	63 (70%)	-	63 (42%)
Thrombolytic Therapy	27 (30%)	-	27 (18%)
Inotropic Support	-	42 (70%)	42 (28%)
Mechanical Circulatory Support	-	18 (30%)	18 (12%)
Surgical Intervention	-	6 (10%)	6 (4%)

Outcomes: The overall in-hospital mortality rate was 40%, with higher mortality observed in the AMI group (45%) compared to the non-AMI group (33%). The mean length of hospital stay was significantly longer in the non-AMI group (15 days) compared to the AMI group (10 days). Major adverse cardiovascular events (MACE) occurred in 45% of the AMI group and 33% of the non-AMI group.

Table 3: Outcomes

Outcome	AMI Group (n=90)	Non-AMI Group (n=60)	Total (n=150)
In-hospital Mortality	41 (45%)	20 (33%)	61 (40%)
Mean Length of Hospital Stay (days)	10 ± 4	15 ± 5	12 ± 5
MACE	41 (45%)	20 (33%)	61 (40%)

These results highlight the significant differences in clinical presentation, management, and outcomes between patients with cardiogenic shock due to AMI and those with non-AMI etiologies. The findings underscore the importance of tailored management strategies to improve patient outcomes.

Discussion

This study provides a comparative analysis of cardiogenic shock (CS) in patients with and without acute myocardial infarction (AMI) over a two-year period. The findings underscore the complexity and high mortality associated with CS, while also highlighting differences in clinical presentation, management strategies, and outcomes between the two patient groups.

Our study shows that the overall in-hospital mortality rate for CS was 40%, which is consistent with previous studies reporting mortality rates ranging from 40% to 50% (1,2). Notably, the mortality rate was higher in the AMI group (45%) compared to the non-AMI group (33%). This disparity may be attributed to the underlying pathophysiology and rapid

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progression of CS in AMI patients, where myocardial ischemia and necrosis play central roles (3).

The majority of AMI patients in our study presented with ST-segment elevation myocardial infarction (STEMI), accounting for 80% of the AMI group. This finding aligns with existing literature, where STEMI is commonly associated with the development of CS due to extensive myocardial damage (4,5). Conversely, non-AMI etiologies of CS in our cohort included severe heart failure, arrhythmias, and valvular heart disease, each of which requires different therapeutic approaches (6).

Management strategies varied significantly between the two groups. In the AMI group, 70% of patients underwent percutaneous coronary intervention (PCI), while 30% received thrombolytic therapy. PCI remains the gold standard for reperfusion in AMI patients with CS, as it has been shown to improve survival rates (7). In contrast, management in the non-AMI group focused more on pharmacologic support with inotropes (70%) and mechanical circulatory support (30%). These findings reflect the broader therapeutic options available for non-AMI CS, which may include device-based interventions like intra-aortic balloon pumps and extracorporeal membrane oxygenation (8,9).

The mean length of hospital stay was significantly longer in the non-AMI group (15 days) compared to the AMI group (10 days). This difference may be due to the varied underlying conditions in the non-AMI group, which often require prolonged and complex management (10). Additionally, the incidence of major adverse cardiovascular events (MACE) was higher in the AMI group (45%) compared to the non-AMI group (33%). This underscores the need for aggressive and early intervention in AMI-related CS to mitigate adverse outcomes (11).

Despite advancements in CS management, our study highlights the persistent high mortality rates, particularly among AMI patients. This calls for further research into novel therapeutic strategies and early identification of high-risk patients to improve prognosis. The implementation of standardized protocols for early diagnosis and management of CS could also play a crucial role in improving patient outcomes (12).

Conclusion

This study demonstrates the significant differences in clinical presentation, management strategies, and outcomes of cardiogenic shock between patients with and without acute myocardial infarction. The higher mortality rate in AMI-related CS highlights the urgent need for rapid and aggressive intervention. Despite advancements in treatment, the overall mortality rate remains high, indicating a critical need for continued research and development of novel therapeutic strategies. Standardized protocols for early diagnosis and tailored management approaches are essential to improve outcomes for patients with cardiogenic shock.

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