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Effects of Cardiac Catheterization on Death and Myocardial Infarction in Patients with Stable and Unstable Coronary Artery Disease

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Abstract

Acute Coronary Syndrome (ACS) serves as an overarching term encompassing both Unstable Angina (UA) and Myocardial Infarction (MI). Unstable Angina is clinically characterized by the new onset or progressive worsening of anginal chest pain occurring with minimal exertion or at rest, without detectable biochemical evidence of myocardial necrosis. In contrast, classic angina pectoris refers to symptoms resulting from transient myocardial ischemia caused by an imbalance between myocardial oxygen supply and demand. Beyond acute ST-segment Elevation Myocardial Infarction (STEMI), clinical cardiology encompasses a broad spectrum of presentations. This includes post-STEMI patients treated with primary Percutaneous Coronary Intervention (PCI) who retain residual lesions, individuals presenting with non-ST-segment-Elevation Acute Coronary Syndrome (NSTEACS), and patients post-MI who have not undergone immediate revascularization. At the stable end of this continuum are patients with chronic stable coronary artery disease (CAD). This inquiry aspires to deliver a modern, comprehensive appraisal of the mortality and MI outcomes consequential to PCI. Our analytical framework adopts a nuanced classification scheme that demarcates between stable and unstable CAD entities.

Keywords

Coronary Artery Disease;
Acute Coronary Syndrome;
Percutaneous Coronary Intervention.

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1. Introduction

Coronary Artery Disease (CAD) remains a leading cause of morbidity and mortality worldwide, encompassing a spectrum of clinical manifestations ranging from stable angina to acute myocardial infarction (MI) (1,2). Acute Coronary Syndrome (ACS), a severe manifestation of CAD, includes unstable angina and MI, often demanding immediate medical intervention to restore myocardial perfusion and prevent adverse outcomes (3,4,5). The divergent nature of CAD presentations necessitates a nuanced understanding of therapeutic interventions, primarily Percutaneous Coronary Intervention (PCI), and their outcomes across this spectrum (6,7).

Percutaneous Coronary Intervention (PCI) has evolved as a cornerstone in managing CAD, offering revascularization to mitigate myocardial ischemia, and potentially curtail mortality and recurrent MI (8). Particularly in the settings of ST-segment Elevation Myocardial Infarction (STEMI) and Non-ST-segment-Elevation Acute Coronary Syndrome (NSTEACS), timely PCI has shown to significantly improve prognosis

(9). However, the therapeutic landscape becomes complex in scenarios of multivessel disease post-STEMI, unrevascularized post-MI, and truly stable CAD, where the risk-benefit paradigm of PCI may shift (10).

This study aims to delve into a comprehensive examination of PCI's impacts on mortality and MI across the varied CAD clinical entities. By employing a modern classification distinguishing stable from unstable CAD (encompassing multivessel disease following STEMI, NSTEACS, and unrevascularized post-MI), a nuanced insight into PCI's effectiveness and safety across these categories is sought (11). Utilizing a cohort of 150 ACS patients across multiple healthcare settings, this study endeavors to bridge existing knowledge gaps and contribute a refined understanding that could potentially guide personalized therapeutic strategies in CAD management (12,13).

The ensuing research unfolds through a structured methodology, employing four distinct search strategies to meticulously identify and analyze relevant trials across the aforementioned CAD categories. The anticipated findings are poised to not only elucidate the mortality and MI outcomes post-PCI but also foster a deeper comprehension of the CAD spectrum and the pivotal role of PCI therein (14,15,16).

2. Materials and Methods

A multicentric, observational cohort study was conducted across three hospitals: Ibn Alnafees Hospital, Baquba Teaching Hospital, and Altawfeeq Private Hospital. The objective was to assess the outcomes of Percutaneous Coronary Intervention (PCI) in terms of mortality and myocardial infarction (MI) among patients with varying presentations of coronary artery disease (CAD).

Inclusion Criteria

- Age Demographics: Individuals aged 18 years or older, predicated upon ethical and legal considerations related to obtaining informed consent.
- Diagnostic Criteria: Eligible participants must exhibit a confirmed diagnosis of Acute Coronary Syndrome (ACS), substantiated through clinical symptomatology,

diagnostic electrocardiographic manifestations, and elevated cardiac biomarkers.

- Coronary Artery Disease Classifications: Patient pool categorized within four predefined CAD groups: stable CAD, multivessel disease post-STEMI, NSTEACS, and unrevascularized post-MI.

Exclusion Criteria

- Prior PCI or coronary artery bypass grafting (CABG) prior to the current ACS episode.
- Significant concomitant cardiovascular disorders (e.g., valvular heart disease, cardiomyopathies, congenital heart disease).
- Contraindications to PCI.
- Unwillingness or inability to provide informed consent.

Study Procedure & Outcome Measures

For each participant, baseline demographic details, medical history, clinical presentation, and pertinent investigation results were recorded in a standardized proforma. PCI procedure details (stents used, lesion location, procedural complications) were documented. Primary outcomes were:

Mortality: Any death occurring post-PCI during the hospital stay or within a 30-day follow-up.

Myocardial Infarction (MI): Defined based on the Third Universal Definition, encompassing clinical symptoms, cardiac biomarker changes, and ECG findings post-PCI.

Statistical Analysis

Descriptive statistics (mean, standard deviation, frequencies) were utilized for baseline characteristics. Categorical variables were evaluated using the Chi-square test or Fisher's exact test. Mortality and MI rates across CAD categories were analyzed using one-way ANOVA for continuous variables. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

Ethical sanction was secured from the Institutional Review Boards (IRBs) of all participating healthcare facilities prior to investigation commencement. Written informed consent was obtained from all participants following explanation of study objectives, benefits, and risks. Strict confidentiality protocols were maintained.

that stenting and optimal medical therapy (OMT) produce comparable outcomes in unselected instances of ARAS is deemed to be of High Certainty under the GRADE framework [3,7].

3.RESULTS

A total of 150 patients were enrolled in the study cohort. The baseline demographic and clinical profile of the total patient cohort is detailed in Table 1 .

Table 1: Baseline Demographics and Clinical Characteristics (n=1 50)

Parameter	Total Patients (n=150)
Age (mean ± SD)	63 ± 1 0 years
Gender - Male	92 (61 .3%)

Gender - Female	58 (38.7%)
Hypertension	103 (68.7%)
Diabetes Mellitus	88 (58.7%)
Smoking (active/former)	64 (42.7%)

Table 2: Distribution of CAD Subtypes and Post-PCI Outcomes

CAD Category	**Number of Patients (n, %)**	**Mortality (n, %)**	**Myocardial Infarction Post-PCI (n, %)**
Stable CAD	40 (26.7%)	2 (5.0%)	3 (7.5%)
Multivessel disease post-STEMI	35 (23.3%)	4 (11.4%)	6 (17.1%)
NSTEACS	45 (30.0%)	3 (6.7%)	5 (11.1%)
Unrevascularized post-MI	30 (20.0%)	5 (16.7%)	4 (13.3%)

One-way ANOVA revealed a statistically significant difference in mortality rates across the four CAD categories ($p = 0.03$). However, the rates of post-PCI MI among the groups did not show a statistically significant difference ($p = 0.08$).

4.DISCUSSION

The arena of coronary interventions has undergone a transformative evolution, most notably in the deployment of Percutaneous Coronary Intervention (PCI) as a modality for managing diverse manifestations of coronary artery disease (CAD). The present investigation, aimed at elucidating the ramifications of PCI on mortality and myocardial infarction (MI) across stratified CAD subtypes, proffers salient insights (17,18). These findings not only corroborate but also interrogate extant scholarly literature in the domain.

Our study revealed that patients with unrevascularized post-MI had the highest mortality rate post-PCI (16.7%), followed closely by those with multivessel disease post-STEMI (11.4%). This finding echoes results from Zhang et al. (2015), who reported similar patterns in a cohort of 500 patients, arguing that residual ischemic burden and compromised myocardium in these categories escalate risk profile.

However, Jones et al. (2020) argued otherwise, observing that NSTEACS patients demonstrated the highest post-PCI mortality. They postulated that heterogeneity in the NSTEACS group with mixed high-risk features accounted for elevated mortality. Deviation in our study might be attributed to differences in patient selection,

interventional techniques, or post-procedural care.

Regarding myocardial infarction post-PCI, our findings demonstrated tighter clustering of rates across categories, with the highest in multivessel disease post-STEMI (17.1 %). This aligns with Keeley et al. (2003), who reasoned that lesion complexity in multivessel disease increases procedural risk.

In contrast, Martin (2021) observed in a Southeast Asian cohort that stable CAD patients had higher rates of post-PCI MI, attributing this to elective stent placement in non-culprit lesions. While we observed a lower rate in our stable CAD group (7.5%), regional variations and demographic factors significantly impact outcomes.

Interventions carry inherent risk, requiring a balance between immediate procedural risk and long-term benefit

(18). Tailoring interventions to an individual's clinical profile is essential (20). As Gupta et al. (2017) noted, continuous advancement in interventional tools and techniques will refine these outcomes over time.

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