



Echocardiographic Assessment and Its Correlation with Coronary Angiography in Acute Coronary Syndrome

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Conflicts of Interest: Nil

Abstract

This retrospective study aims to evaluate correlation between echocardiographic parameters and coronary angiography findings in ACS patients admitted to MGM Medical College. 100 patients were included. Diagnosed with ECG following which underwent 2D ECHO & CAG, thereby assessing the diagnostic utility of echocardiography as a important tool in ACS also calculated sensitivity & specificity. Male were (52.00%) compared to females (48.00%). A notable proportion of patients reported lifestyle risk factors: smoking was present in 38.00%, while alcohol consumption was noted in 34%. Co-morbid conditions were also prevalent, with diabetes mellitus (DM) affecting 44.00%

of the patients, hypertension (HTN) in 57.00%, and dyslipidemia the 51.00%. Results showed significant correlation between 2D-ECHO & CAG findings, helping identifying infarct vessel. In conclusion, the study underscores the importance of echocardiography in diagnosing and assessing ACS, providing valuable insights into patient management and risk stratification.

Keywords: Acute Coronary Syndrome, Coronary Angiography, Coronary Artery, Dyslipidemia

Introduction

Acute coronary syndrome (ACS) encompasses a spectrum of conditions including unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial

infarction (STEMI). Unstable angina is characterized by chest pain or discomfort due to reduced blood flow to the heart without cell death or heart tissue damage. NSTEMI involves partial blockage of the coronary artery, leading to cell death and heart muscle damage, while STEMI results from complete blockage of the coronary artery, causing extensive heart tissue damage and cell death, commonly known as heart attack or myocardial infarction.¹

The pathophysiology of ACS primarily involves atherosclerosis, where fatty deposits or plaques build up on the walls of the coronary arteries, leading to reduced blood flow to heart muscles. Plaque rupture or erosion triggers the formation of blood clots that obstruct blood flow, resulting in myocardial ischaemia.² Myocardial ischaemia occurs when the heart muscle does not receive sufficient oxygen and nutrients owing to reduced blood supply, leading to cell injury or death. This ischemic insult can have various consequences, including unstable angina, NSTEMI, or STEMI, depending on the severity and duration of the blockage, affected myocardial area, and compensatory mechanisms.³

CAG plays a crucial role in diagnosing ACS and in assessing CAD.⁴ This imaging technique allows healthcare providers to visualize blockages or stenosis in the coronary arteries, providing essential information regarding the severity and location of coronary artery lesions.⁵ By identifying areas of poor blood flow or damage to the heart, CAG helps determine the extent of CAD and guide treatment decisions for patients with ACS.⁶

The importance of CAG lies in its ability to directly visualize the coronary arteries, enabling healthcare

providers to identify blockages that may cause myocardial ischaemia or infarction. This information is vital for determining the appropriate course of treatment, such as percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG), to restore blood flow to the heart muscles and prevent further cardiac complications. Additionally, CAG aids in assessing the risk of cardiovascular events by providing detailed insights into the presence and severity of CAD, allowing for tailored management strategies based on individual patient needs.⁷

This retrospective study aims to evaluate correlation between echocardiographic parameters and coronary angiography findings in ACS patients admitted to MGM Medical College, thereby assessing the diagnostic utility of echocardiography as a non-invasive predictor of coronary artery disease severity.

Material and methods

Study Design

Retrospective observational study

Study Setting and Period

Medical records of patients admitted to MGM Medical College, Kamothe, Navi Mumbai, from January 2024 to December 2024.

Study Population

Adults (≥ 18 years) diagnosed with ACS (STEMI, NSTEMI, Unstable Angina) who underwent trans-thoracic echocardiography and coronary angiography.

Inclusion Criteria

Age ≥ 18 years.

Confirmed diagnosis of ACS based on clinical, ECG, and biomarker criteria.

Underwent echocardiography and coronary angiography during same admission.

Exclusion Criteria

Incomplete echocardiographic or angiographic data.
History of significant valvular heart disease or cardiomyopathy.
Poor echocardiographic image quality.
Prior coronary artery bypass grafting or percutaneous coronary intervention.

Data Collection

Clinical Data: Age, sex, risk factors, clinical presentation, ECG, and biomarkers. (if available)

Echocardiographic Data: LVEF, presence/location of regional wall motion abnormalities, diastolic function, chamber dimensions.

Coronary Angiography Data: Number of vessels involved, location and severity of stenosis, presence of left main disease, Syntax score if available.

Data Management

Data will be recorded in a structured proforma and anonymized to protect patient confidentiality.

Ethical Issues

1. Protocol approval from institutional ethics committee
2. Informed consent obtained from study subjects

Statistical Analysis

Descriptive statistics for demographics and clinical data. Correlation between echocardiographic parameters and angiographic findings done by calculation of sensitivity, specificity of echocardiography using angiography as gold standard.

Results

Table 1: Patient's characteristics

Mean age		59.23±11.39 years
Male : Female		52 : 48
Hypertension present		57 (57.00%)
Diabetes present		44(44.00%)
Smoking history present		38 (38.00%)
Alcohol history present		34 (34.00%)
Dyslipidemia present		51 (51.00%)
Clinical Presentation	STEMI	52 (52.00%)
	NSTEMI	28 (28.00%)
	Unstable angina	23 (23.00%)
Trop I positive		79 (79.00%)
Hospital stay		11.23±2.15 days

The study population consisted predominantly of males (52.00%) compared to females (48.00%). A notable proportion of patients reported lifestyle risk factors: smoking was present in 38.00%, while

alcohol consumption was noted in 34%. Comorbid conditions were also prevalent, with diabetes mellitus (DM) affecting 44.00% of the patients, hypertension (HTN) in 57.00%, and Dyslipidemia the 51.00%.

Table 2: Distribution of angiographic findings in study population

Angiographic findings	No of patients
Single vessels disease	45(45.00%)
Double vessels disease	40(40.00%)
Triple vessels disease	15(15.00%)

Single vessel involvement was the commonest angiographic finding in 45.00% of patients followed by Double vessel disease in 40.00% and triple vessel disease in 15.00%. Common risk factors: Hypertension, diabetes, smoking, alcoholism, dyslipidemia, family history of CAD, COPD, CKD, hypothyroidism, rheumatoid arthritis.

Based on the master chart data, the echocardiography (echo) was able to match angiography findings in 73 out of 100 cases, giving a sensitivity of 73%. This means echo correctly identified the culprit lesion 73% of the time compared to angiography. Total "Echo Yes" (matched angiography findings): 73 cases Total "Echo No" (did not match): 27 cases so Sensitivity: 73% Echo matched angiography findings in 73 cases ("Yes"), did not match in 27 ("No") Sensitivity of echo for culprit lesion detection using angiography as reference: 73%, True Negatives (TN) = 27; False Positives (FP) = 6, Specificity = $TN / (TN + FP) = 27 / (27 + 6) = 27 / 33 \approx 0.8182$, So, the specificity is approximately 81.82%.

Discussion

Study Examined 100 patients with acute coronary syndrome. Patients suspected from their clinical presentation then did their ECG, Troponin, Echocardiography to identify systolic and diastolic dysfunction, Regional wall motion abnormality, Ejection fraction of left ventricle, and Coronary Angiography to identify involved coronary arteries. The incidence of hypertension in various studies varied between 30 to 54%. The present study showed an incidence of 57%.

Diabetes mellitus is the next important risk factor. The incidence in various studies varied from 26 to 56% The present study showed an incidence of 44%. The presence of diabetes is a relatively greater risk factor for CAD in women versus men, increasing a woman's risk of CAD by 3-to 7-fold, with only a 2-to 3-fold increase in diabetic men.⁸ Furthermore, women with diabetes have a greater than 3-fold increase in CAD risk than non-diabetic women do.⁸

Reciprocal Depression in ECG Leads: 38% of patients had reciprocal ST segment depressions.

Results of Coronary Angiogram: Single vessel disease (SVD) was found in 45%, double vessel disease (DVD) in 40%, and triple vessel disease (TVD) in 15%

Correlation of Echo Changes with CAG findings: Sensitivity, specificity for identifying coronary artery involvement were calculated.

Analysis showed Sensitivity & Specificity to be 73.0% & 81.8% respectively.

Limitations of the study

In our study patients were randomly selected retrospectively based on availability of full data and it's a single centre study with limited number of patients.

Conclusion

In conclusion, the study shows the importance of ECG and echocardiography in diagnosing and assessing ACS, providing valuable insights into patient management and risk stratification. Echo is a reliable tool in early and longitudinal assessment of ACS patients. Its high

sensitivity & Specificity makes it a valuable tool in daily clinical practice.

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