SUBMITTING A PROPOSAL TO SHORT TERM STUDENTSHIP (STS-2024)

FOR CONSIDERATION BY ICMR

Reference ID: STS2025-14656

1. Title of the Proposal:

The Predictive Role of Novel Echocardiographic Calcification Score in 30-dayMajor Adverse Cardiovascular Outcomes in acute STEMI Patients

Or

Echocardiographic Calcification Score as a Predictor of 30-Day Major Adverse Cardiovascular Events in Acute STEMI: A Prospective Observational Study

2. Introduction:

Background:

The Global Burden of Disease Study (1) estimated that ischemic heart disease (IHD), which includes Acute coronary syndrome, led to 1.54 million deaths and 36.99 million disability-adjusted life years (DALYs) in India in 2017. ST-elevation myocardial infarction (STEMI) is the most severe manifestation comprising up to 60% of all ACS. (2)

Despite timely revascularization and standard of care treatment, the risk of early complications persists. Nearly 10–20% (3, 4, 5) of patients experience major adverse cardiovascular events (MACE)—a composite of all-cause mortality, non-fatal myocardial infarction, heart failure, and target vessel revascularization—within 30 days of the index event [3]. Predicting these events remains critical to guide early intervention and improve outcomes.

Conventionally, clinical risk scores (e.g., CARDILLAC, GRACE) (5) and CT based Cardiac calcium score have been employed for risk stratification. (6) However, these methods are limited by resource constraints, radiation exposure, or reliance on complex calculations. Echocardiography, a widely accessible, non-invasive, and affordable tool, has the potential to serve as a reliaable alternative.

The Hirschberg Echocardiographic Calcification Score (echo-CCS) is a novel, point of care imaging technique that assesses calcification across five major cardiac structures [7]. A score ≥ 3 has been associated with significant coronary artery disease and increased long-term mortality, yet its predictive value for short-term outcomes such as 30-day MACE in acute STEMI remains underexplored.

This study aims to bridge that knowledge gap by prospectively evaluating the utility of echo-CCS in predicting 30-day MACE in patients with acute STEMI.. By comparing outcomes

between patients with high versus low echo-CCS, this research may establish echo-CCS as an effective, rapid, and scalable tool for early risk stratification in acute STEMI, especially in resource-limited settings.

3. Objectives:

Primary Objective:

Comparison of 30-Day Major adverse cardiac events Between High and Low echocardiographic calcification scores in acute STEMI Patients

Secondary Objectives:

a) To compare the demographic characteristics and cardiovascular risk profiles of acute STEMI patients with high echocardiographic calcification scores (eCS) versus those with low eCS

b) To assess the distribution of individual components of 30-day MACE in patients with acute STEMI

4. Methodology:

A. Study design: Prospective observational cohort study

B. Study Population: Patients presenting with Acute ST-elevation myocardial infarction (STEMI) at a tertiary care center in South India.

C. Study Participants

a) Inclusion Criteria:

i) Age ≥ 18 years
ii) Patients with a confirmed diagnosis of acute STEMI
iii) Undergoing standard of care treatment
iv) Consent to participate in the study and for follow-up

b) Exclusion Criteria

i) Prior history of significant valvular heart disease or valve replacement
ii) Chronic kidney disease stage 4 or 5 (due to increased vascular calcification bias)
iii) Anticipated survival < 1 year due to non-cardiac causes

iv) Lost to follow-up or unwilling to consent

D. Number of Groups

Participants will be followed up for 1 month post-discharge and divided into two groups based on outcomes:

a) Group 1: echo-CCS>3 as per Hirschberg score
b) Group 2: echo-CCS<3 as per Hirschberg score

E. Sampling

a) Sample Size Calculation: XYZ

F. Sampling Technique

Consecutive Sampling of eligible acute STEMI patients meeting inclusion criteria.

G. Data collection period:
Recruitment of patients for 1 month during summer vacation post IEC clearance. Follow up after 30 days of PCI.

Total study duration: **2 months**

H. Study methodology:

Upon receiving clearance from the Institutional Ethics Committee (IEC), the primary investigator (PI) will proceed with the first phase of the study, which involves recruitment of study participants from the casualty. The institution where the study is being conducted receives a daily footfall of 8-10 acute STEMI patients.

The PI will identify eligible patients based on predefined inclusion criteria and will take note of their identification (Name, age, gender) and Hospital number.

After the patient has received standard of care treatment and is able to cooperate, the PI will obtain informed consent from each patient. The consent process will ensure that the patients understand their participation in the study, the purpose of the research, the nature of the follow-up involved, and any potential risks associated with the study. As part of the informed consent, patients will be clearly informed that follow-up assessments will take

place 30 days post-discharge to monitor for the **Primary endpoint** of the study, Major Adverse Cardiovascular Events (MACE), which is defined as the composite of all-cause death, readmission for heart failure, non-fatal MI and target vessel revascularization. If more than one MACE occurred during the follow-up period, the most severe endpoint (all-cause death > myocardial infarction > revascularization) was selected for the 30-day MACE analysis. (x) The patient will be asked to consent to be contacted by the PI for this follow-up.

If informed consent is not provided, all patient information collected till then will be deleted and the given patient will not be enrolled in the study.

After receiving informed consent, in addition to the echocardiographic evaluation the PI will document a comprehensive record of the patient's medical history, risk factors (such as hypertension, diabetes, smoking status, lipid profile, family history of cardiovascular disease, etc.), and any other relevant clinical information that may impact their cardiovascular risk based on the preformed proforma.

Hirschberg score is a novel technique for evaluating the echocardiographic calcification score (echo-CCS) in patients with acute STEMI, but lacks data to back its clinical relevance and utility. Cardiologists from the Department of Cardiology will perform an Echocardiogram for the eligible patients after receiving informed consent and will record the echo-CCS as per the Hirschberg score.

Hirschberg score: The Hirschberg Echocardiographic Calcification Score is a straightforward method to assess cardiac calcification using standard transthoracic 2D echocardiography.

It evaluates five key cardiac structures for the presence of any visible calcium:
a) The aortic valve
b) Aortic root
c) Mitral annulus
d) Papillary muscles
d) Ventricular septum.
Each structure is scored as 0 if there is no calcification and 1 if any calcification is present.

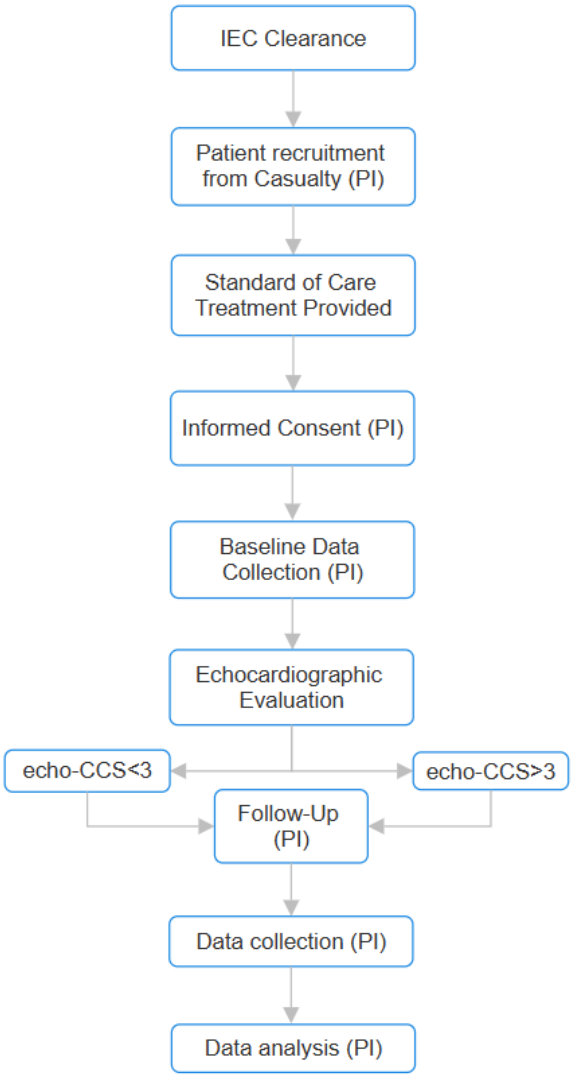
The total score ranges from 0 to 5. A score of 3 or more is significantly associated with obstructive coronary artery disease and is linked with higher all-cause mortality. This score is simple to apply in routine echocardiograms and may help with risk stratification for coronary artery disease.

Thirty days following the initial PCI and discharge, the PI will initiate a follow-up call to each participant. During this follow-up call, the PI will inquire about any occurrences of MACE, assessing the patient's status and documenting any significant cardiovascular events.

Patients who do not respond to the follow-up call, despite reasonable (no response to 2 calls on alternate days and text messages requesting for an appointment to call for 5 days) attempts to contact them, will be excluded from the study. The PI will maintain a detailed record of all patient interactions, ensuring that all data is handled in accordance with ethical and privacy standards.

The PI will then perform subgroup analysis between patients with high echoo-CCS and low echo-CCS. The components of the MACE endpoints were also evaluated individually. Data will be collected and coded on excel and analyzed using STATA 18.0.

Figure 1. The flow of the study



D. Statistical tests considered for data analysis:

Data will be entered in Excel and analyzed using STATA 18.0. Continuous variables will be tested for normality. Parametric data will be compared using the t-test, and non-parametric data using the Mann-Whitney U test. Categorical variables will be analyzed using the Chi-square or Fisher's exact test. The primary outcome—30-day MACE—will be compared between high (eCS ≥3) and low (eCS <3) groups using the Chi-square test. A binary logistic regression will be performed to assess the independent association between high eCS and MACE after adjusting for confounders.

5. Implications:

The results of this study will pay way for enhanced risk stratification and clinical management of patients with acute STEMI. If echo-CCS proves to be a reliable predictor of 30-day major adverse cardiovascular events (MACE), it could become a useful, non-invasive, and easily accessible tool for early risk stratification. This will help clinicians identify patients who'll require intensive monitoring and therapy and thereby decrease the incidence of harmful sequelae post acute STEMI including death.

To conclude, echo-CCS would emerge as a safe, affordable, accessible and reliable tool for Cardiologists. It would provide new avenues for wider adoption for eCS in routine Clinical care as a safer alternative to the conventional CT based Cardiac Calcium Score.

6. **References**

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