

Ordinal Coronary Artery Calcification Score: Acute Chest Pain Risk Stratification in the Emergency Department

Ordinal Koroner Arter Kalsifikasyon Skoru: Acil Serviste Akut Göğüs Ağrısı Risk Sınıflandırması

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ABSTRACT

Aim: Chest pain is one of the most common reasons for visiting the emergency department (ED). This study aimed to determine the diagnostic performance of the simple Ordinal Score in predicting 30-day major adverse cardiac events (MACE) in adult patients presenting to the ED with chest pain.

Material and Methods: This single-center, cross-sectional study was conducted at the ED of a tertiary teaching and research hospital. All patients who presented with chest pain who did not meet the exclusion criteria were included. The simple Ordinal score was independently assessed on thorax computed tomography (CT) scans. The effectiveness of the simple Ordinal score in predicting MACE was evaluated using a receiver operating characteristic (ROC) curve analysis and diagnostic test characteristics.

Results: Forty-nine patients were included in the study. MACE occurred in 10 patients but not in the remaining 39 patients. The area under the curve (AUC) for the simple Ordinal score assessed by the emergency medicine specialist (EMS) was 0.913, and the cut-off value was (≥ 4), with a sensitivity of 90.0% (95% CI, 55.5% - 99.8%) and a specificity of 74.4% (95% CI, 57.9% - 87.0%). The AUC for the simple Ordinal score by the radiologist was 0.921, and the cut-off value was (≥ 4), with a sensitivity of 90.0% (95% CI, 55.5% - 99.8%) and a specificity of 84.6% (95% CI, 69.5% - 94.1%).

Conclusion: The simple Ordinal score, assessed by an EMS on thorax CT, has high sensitivity and moderate specificity for detecting MACE in patients with chest pain.

Keywords: Chest pain, coronary artery calcification, simple ordinal score

ÖZ

Amaç: Göğüs ağrısı, acil servise başvuru nedenleri arasında en sık görülenlerden biridir. Bu çalışmanın amacı, acil servise göğüs ağrısı şikayeti ile başvuran yetişkin hastalarda 30 günlük majör kardiyak olayları (MACE) öngörmeye basit Ordinal Skoru kullanılarak performansını belirlemektir.

Gereç ve Yöntemler: Bu tek merkezli, retrospektif çalışma, bir üçüncü basamak eğitim ve araştırma hastanesinin acil servisinde gerçekleştirilmiştir. Göğüs ağrısı ve/veya ilgili semptomlarla başvuran ve dışlama kriterlerini karşılamayan tüm hastalar çalışmaya dahil edildi. Basit Ordinal skor, torasik bilgisayarlı tomografi (BT) taramaları üzerinde bağımsız olarak değerlendirildi. MACE'yi öngörmeye basit Ordinal skoru etkinliği, alıcı işletim karakteristiği (ROC) eğri analizi ve tanısal test karakteristikleri kullanılarak değerlendirildi.

Bulgular: Çalışmaya 49 hasta dahil edildi. Bu hastaların 10'unda MACE gelişti, ancak 39'unda gelişmedi. Acil tıp uzmanı (ATU) tarafından değerlendirilen basit ordinal skor için eğri altındaki alan (AUC) 0,913 idi, kesme değeri (≥ 4) idi, duyarlılığı %90,0 (95% CI, 55,5% - 99,8%) ve özgüllüğü %74,4 (95% CI, 57,9% - 87,0%) idi. Radyolog tarafından basit ordinal skor için AUC 0,921 idi ve kesme değeri (≥ 4) idi, duyarlılık %90,0 (95% CI, 55,5% - 99,8%) ve özgüllük %84,6 (95% CI, 69,5% - 94,1%) idi.

Sonuç: ATU tarafından torasik BT'de değerlendirilen basit Ordinal skoru, göğüs ağrısı olan hastalarda MACE'yi tespit etmek için yüksek duyarlılığa ve orta düzeyde özgüllüğe sahiptir.

Anahtar Kelimeler: Göğüs ağrısı, koroner arter kalsifikasyonu, basit ordinal skor

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Introduction

Chest pain is a frequent reason for emergency department (ED) visits (1). The approach to chest pain in the ED is a race against time, requiring accurate risk classification to rapidly identify high-risk patients and prevent unnecessary admissions of low-risk patients (2). Acute coronary syndrome (ACS) is one of the most critical diagnoses among patients presenting with chest pain. Therefore, promptly identifying and managing ACS is essential in the treatment strategy for chest pain (3, 4). According to the studies and European Society of Cardiology (ESC) guidelines, the initial evaluation and management of ACS involve performing an electrocardiogram (ECG) and measuring cardiac troponin levels (5-7). However, due to the risks associated with misdiagnosis or premature discharge, the ESC also recommends non-invasive imaging modalities, such as stress testing and coronary computed tomography angiography (CCTA), to further stratify risk and diagnose coronary artery disease during the patient's stay in the ED (8).

Coronary artery calcification (CAC) is a well-established cardiovascular risk factor, and many studies have displayed a noteworthy correlation between the presence of CAC and associated coronary occlusion (9-11). The Agatston method is the traditional method for measuring the CAC. This method calculates the CAC score from electron beam computed tomography (EBCT) scans (12-14). However, this method requires a unique ECG synchronization protocol and special analysis software. Consequently, it is not practical in the ED (15). In contrast, some studies have reported a CAC scoring method that provides a simple Ordinal score from 0 to 12 using thorax computed tomography (CT) scans (16, 17). This method, which does not require an ECG synchronization protocol or unique analysis software, is based solely on a visual estimation of the extent of coronary artery involvement by CAC. Therefore, it is practical in the ED.

Thorax CT is frequently utilized in EDs for various critical diagnoses (18, 19). Recent studies have investigated the diagnostic performance of CAC evaluation via thorax CT to exclude ACS in ED settings (4, 20). The assessment of the CAC score on thorax CT is a simple, effective method. Furthermore, thorax CT is a readily accessible imaging method in the ED. There is a lack of studies evaluating the diagnostic accuracy of a simple Ordinal scoring system for CAC assessed by an emergency medicine specialist (EMS) on thorax CT. Based on the hypothesis that thorax CT, which is used for various critical diagnoses, can be used by an EMS to identify high-risk patients among those presenting with chest pain, this study aimed to determine the diagnostic performance of a simple Ordinal score in predicting 30-day major adverse cardiac events (MACE) in adult patients presenting to the ED with chest pain.

Material and Methods

Study design and setting

This single-center, cross-sectional study was conducted at the ED of a tertiary teaching and research hospital. All patients aged 18 years and older who presented to the ED with chest pain between 4 August 2023 and 3 August 2024 and did not meet the exclusion criteria were included. The thorax CT scans of the patients included in the study were assessed by the EMS and a radiologist between 1 and 31

August 2025, and a simple Ordinal score was calculated. The diagnostic value of this simple Ordinal score was then evaluated. Prior to initiating the study, approval was obtained from the local ethics committee (Decision No. 2024/280)

Patient selection

All patients aged 18 years and older who presented to the ED with chest pain were evaluated. Two-stage exclusion criteria were applied: first, patients with myocardial infarction with ST segment elevation (STEMI), patients with trauma-related chest pain, pregnant patients, patients who died in the ED, and patients for whom 1-month MACE could not be calculated were excluded. Finally, patients who did not undergo thorax CT scanning and patients whose CT scans could not be evaluated (due to artifacts, presence of contrast, etc.) were excluded. All patients were included in the study if they met the inclusion criteria and did not meet the exclusion criteria. The flow chart of the study population and design is shown in Figure 1.

Study protocol and data collection

All patient data were obtained from the hospital's digital archive. The collected data included demographic details, comorbidities, smoking history, family history, selected laboratory parameters (urea, creatinine and troponin), HEART score, non-contrast thorax CT, and non-contrast thorax CT findings.

The presence of a thorax CT scan was defined as a non-contrast thorax CT scan obtained at the time of ED presentation or within one month prior to ED presentation. It was confirmed via the hospital's digital archive that the non-contrast thorax CT scans were performed for non-traumatic conditions (non-traumatic pneumothorax, pleural effusion, pneumonia, etc.). As the assessment was designed to predict 30-day MACE, the likelihood that the chest pain had a cardiac cause was also assessed within this one-month timeframe. Consequently, thorax CT scans performed more than one month prior were excluded from the analysis. An EMS and a radiologist analyzed the non-contrast thorax CT scans.

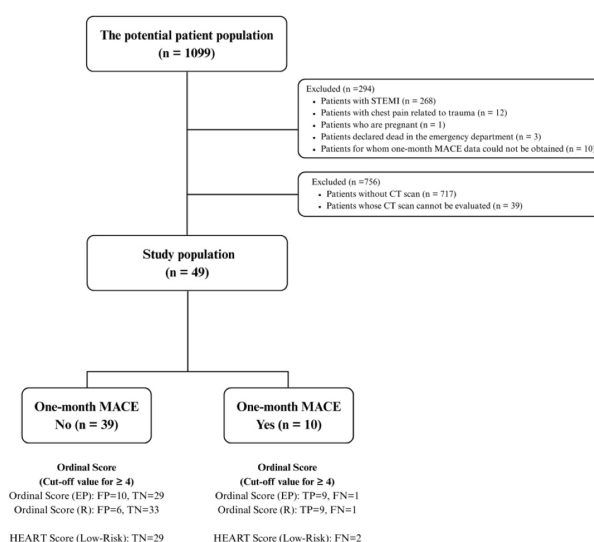


Figure 1. The patients' flowchart. STEMI: Myocardial infarction with ST segment elevation, MCE: Major adverse cardiovascular events, CT: Computed tomography, EP: Emergency physician, R: Radiologist, TP: True positive, FP: false positive, TN: True negative, FN: False negative

The radiologist had four years of experience in cardiothoracic CT imaging. The EMS had five years of specialist experience. The EMS underwent prior training with a radiologist on simple Ordinal scoring and completed 50 imaging assessments, which an experienced radiologist subsequently validated. Following this training phase, the EMS performed ordinal scoring of thorax CT scans for the study. Both the EMS and the radiologist were blinded to the patients' clinical information. Moreover, the EMS and the radiologist were unaware of each other's findings.

MACE events were classified as follows: primary or recurrent ACS following early admission; heart failure; percutaneous coronary intervention (PCI); coronary artery bypass grafting (CABG); and sudden cardiac death (21). Whether patients developed a MACE within 30 days was verified via the hospital's digital archive, e-Nabiz records, and, where necessary, telephone interviews.

CT Assessment

All the patients' CT scans were obtained with a 160-slice multidetector CT scanner (Canon; Aquilion Prime SP, Canon Medical Systems Co, Otawara, Japan) with 0.5-1.2 mm thick slices and 120 kVp. CT evaluations were made after excluding images that could affect the measurement evaluation (artifacts, presence of contrast, etc.). The EMS and radiologist independently evaluated the CT scans using the hospital's digital archive picture archiving and communication system (PACS). For evaluation, coronary calcification was first assessed as present or absent on non-contrast thorax CT. Then, in the presence of calcification, the coronary vessels with calcification were identified, and finally, a simple Ordinal score was calculated.

Each major coronary artery was identified to calculate a simple Ordinal score. Illustrative images of the coronary arteries are shown in Figure 2. The EMS and radiologist assessed each vessel and graded the severity as 0 (absent), 1 (mild), 2 (moderate), or 3 (severe). CT images showing the calculation of the Ordinal score for the left anterior descending coronary artery are shown in Figure 3. CAC severity was graded by the proportion of the vessel length affected: less than one-third as mild, one-third to two-thirds as moderate, and more than two-thirds as severe. These values were then aggregated to produce an Ordinal score between 0 and 12 per scan (22, 23).

Endpoints

The primary endpoint of this study was to evaluate the diagnostic value of a simple Ordinal score in predicting 30-day MACE in adult patients presenting to the ED with chest pain.

Statistical analysis

All analyses were performed with R based statistical software (The Jamovi Project (2025) Computer Software, version 2.6. Sydney, Australia). Categorical data are expressed as frequency (n) and percentage. Continuous variables are presented as mean plus standard deviation (SD), or median and interquartile range (IQR), as appropriate. The normality assessment was performed with histograms, QQ plots, and the Shapiro-Wilk test. Continuous data were compared with parametric or nonparametric tests (Student's t-test or Mann-Whitney U), and categorical data with the chi-square test.

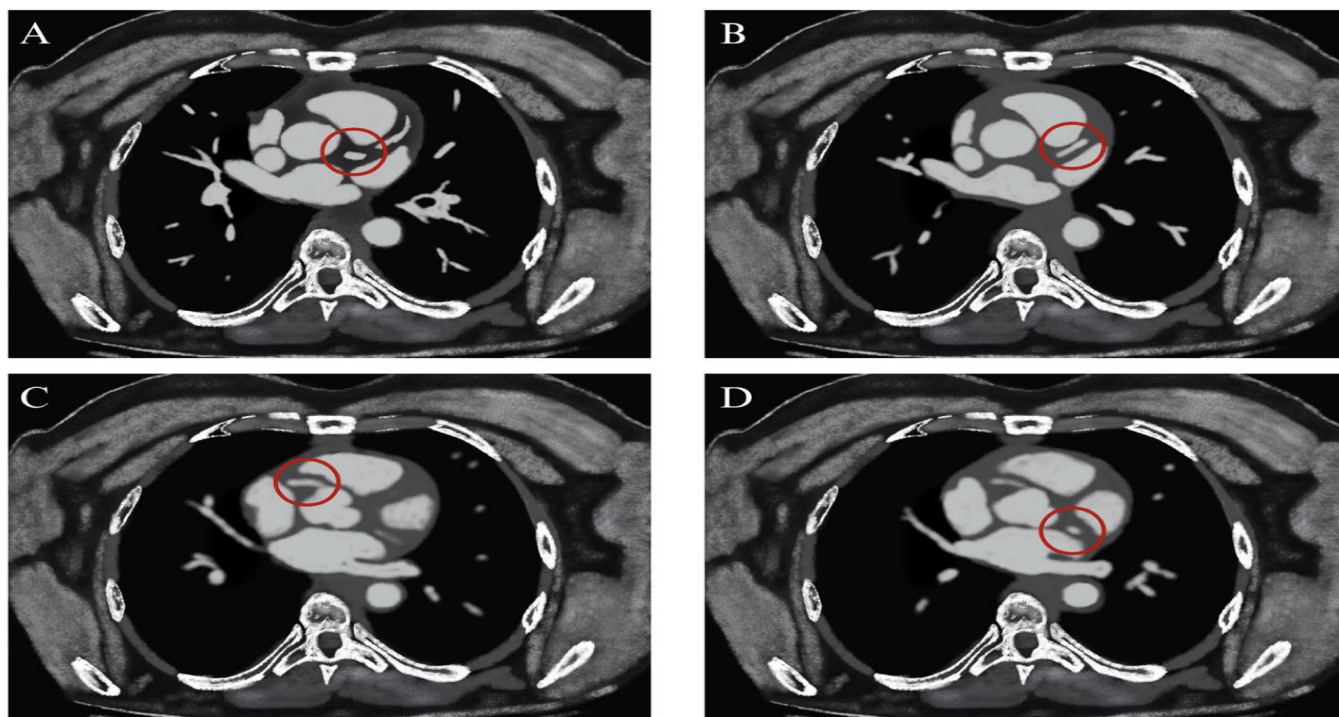


Figure 2. An illustrative image of the coronary arteries: A) Left (main) coronary artery, B) Proximal segment of the left anterior descending (LAD) artery, C) Proximal segment of the right coronary artery (RCA), D) Proximal segment of the circumflex artery (LCx)

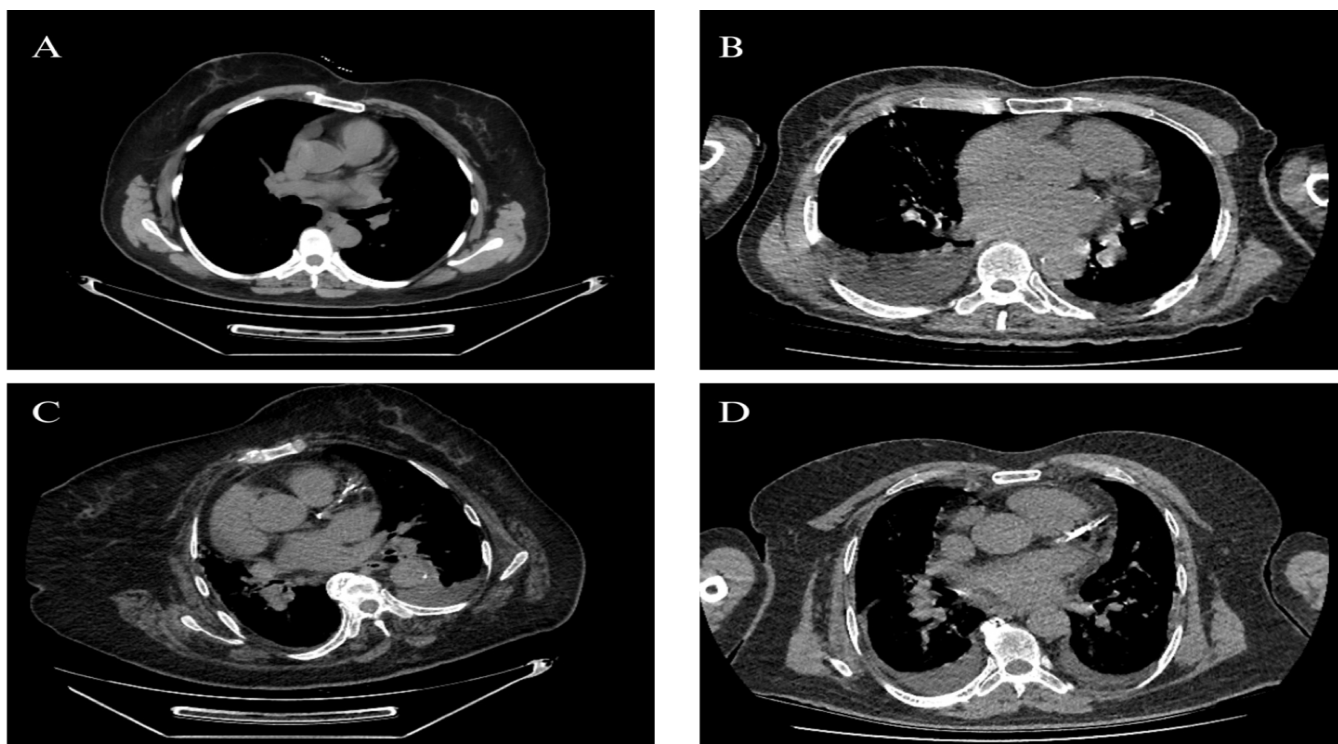


Figure 3. Computed tomography image of the Ordinal score for the left anterior descending coronary artery: A) No calcification (0), B) Less than 1/3 of the artery is calcified (1), C) Calcification between 1/3 and 2/3 of the artery (2), D) Calcification of more than 2/3 of the artery (3).

Reliability between measurements was assessed using the intraclass correlation coefficient (ICC). ICC < 0.5 was interpreted as “poor,” 0.5–0.74 as “moderate,” 0.75–0.89 as “good,” and ≥ 0.90 as “perfect” in terms of reliability. A receiver operating characteristic (ROC) curve was constructed to find out the best cut-off values for the simple ordinal score. The Youden index (maximum value) was used in the ROC analysis to select the cut-off value. The diagnostic test characteristics (sensitivity, specificity, likelihood ratios (+LR and -LR), and predictive values (PPV and NPV) were calculated with 95% CIs (confidence interval) for the final diagnostic strategies. P values < 0.05 were considered significant for all analyses.

Results

During the study period, 1099 potential patients were registered. Of these, 1050 patients were excluded, resulting in a final population of 49 patients. Among them, 10 (20.4%) patients had MACE, while 39 (79.6%) did not. Twenty-six (53.1%) patients were male, and 23 (46.9%) were female. The mean age of the patients was 63.2 (SD: 9.8) years. Hypertension (HT) and hyperlipidemia are the most common comorbid diseases. The HEART score was classified as low risk in 31 patients. The median HEART score was 3, with an IQR of 3–5. The patient's simple Ordinal score median was 3 in the EMS evaluation and 2 in the radiologist evaluation, with an IQR of 2–4 for both evaluators. Twenty-four patients had unstable angina pectoris (UAP), and 7 had myocardial infarction without ST-segment elevation (NSTEMI). MACE developed in 4 (40.0% of those who developed MACE) of the UAP patients and in 6 (60.0% of those who developed MACE)

of the NSTEMI patients. No patients other than those with UAP or NSTEMI developed MACE. Seven patients (14.3%) had undergone PCI. Six of the CT scans were taken within the last month, while 43 were taken at the time of admission to the ED. The hospitalization admission rate was 22.4%. The patients' demographic data, simple Ordinal score, and CT findings are shown in Table 1.

In addition, the interrater agreement between the EMS and the radiologist for the Ordinal score was assessed, yielding an ICC of 0.964 (95% CI: 0.942–0.977), indicating a “Perfect” level of reliability.

The effectiveness of the simple Ordinal score in predicting MACE was evaluated using ROC curve analysis and diagnostic test characteristics. The ROC analysis demonstrated that the Ordinal score, as assessed by both physicians, outperformed the HEART score, with area under the curve (AUC) values of 0.913 and 0.921, compared to 0.847 for the HEART score. The AUC for the simple Ordinal score assessed by the EMS was 0.913, and the cut-off value was (≥ 4), with a sensitivity of 90.0% (95% CI, 55.5% - 99.8%) and a specificity of 74.4% (95% CI, 57.9% - 87.0%). The AUC for the simple Ordinal score by the radiologist was 0.921, and the cut-off value was (≥ 4), with a sensitivity of 90.0% (95% CI, 55.5% - 99.8%) and a specificity of 84.6% (95% CI, 69.5% - 94.1%). The characteristics of diagnostic test statistics and the ROC curve analysis are summarized in Table 2 and Figure 4.

Characteristics	All Patients (N=49)	One-month MACE No (N=39)	One-month MACE Yes (N=10)	P
Male, n (%)	26 (53.1)	19 (48.7)	7 (70.0)	0.299
Age (years), mean ± SD	63.2 ± 9.8	62.8 ± 10.4	64.8 ± 7.0	0.578
Comorbidities				
Hypertension, n (%)	33 (67.3)	25 (64.1)	8 (80.0)	0.464
Diabetes, n (%)	11 (22.4)	9 (23.1)	2 (20.0)	1.000
Hyperlipidemia, n (%)	23 (46.9)	16 (41.0)	7 (70.0)	0.157
CKD, n (%)	4 (8.2)	2 (5.1)	2 (20.0)	0.180
Smoking History, n (%)	17 (34.7)	13 (33.3)	4 (40.0)	0.721
Family History, n (%)	19 (38.8)	13 (33.3)	6 (60.0)	0.156
Laboratory Indices				
Urea (mg/dL), median (IQR)	36.0 (29.0-52.0)	36.0 (29.5-50.5)	36.5 (29.8-68.3)	0.594
Creatinine (mg/dL), median (IQR)	0.88 (0.74-1.00)	0.86 (0.70-0.98)	0.91 (0.84-1.32)	0.243
Troponin (ng/L), median (IQR)	19.7 (6.7-43.6)	13.4 (6.2-39.0)	30.3 (8.9-44.4)	0.646
Control Troponin* (ng/L), median (IQR)	18.6 (7.2-42.3)	14.8 (7.4-40.7)	25.5 (9.9-46.2)	0.585
HEART Score, median (IQR)	3 (3-5)	3 (3-4)	5 (5-7)	0.001
HEART Score (Low-Risk Count), n (%)	31 (63.3)	29 (74.4)	2 (20.0)	0.001
Ordinal Score				
EMS, median (IQR)	3 (2-4)	2 (1-4)	5 (4-6)	0.001
Radiologist, median (IQR)	2 (2-4)	2 (1-3)	5 (4-7)	0.001
CT scans (in the last month), n (%)	6 (12.2)	4 (10.3)	2 (20.0)	0.402
Computed Tomography Findings				
EMS Ordinal score (≥4), n (%)	19 (38.8)	10 (25.6)	9 (90.0)	0.001
Radiologist Ordinal score (≥4), n (%)	15 (30.6)	6 (15.4)	9 (90.0)	0.001
Main LAD calcification, n (%)	18 (36.7)	13 (33.3)	5 (50.0)	0.465
LAD calcification, n (%)	33 (67.3)	23 (59.0)	10 (100.0)	0.020
RCA calcification, n (%)	31 (63.3)	22 (56.4)	9 (90.0)	0.070
Cx calcification, n (%)	29 (59.2)	20 (51.3)	9 (90.0)	0.034
UAP, n (%)	24 (49.0)	20 (51.3)	4 (40.0)	0.001
PCI, n (%)	7 (14.3)	0 (0.0)	7 (70.0)	0.001
Hospitalization, n (%)	11 (22.4)	2 (5.1)	9 (90.0)	0.001
Mortality, n (%)	1 (2.0)	0 (0.0)	1 (10.0)	0.204

Table 1. The patients' demographic data and baseline characteristics

IQR: Interquartile Range (25p, 75p), SD: standard deviation, CKD: Chronic Kidney Disease, EMS: Emergency Medicine Specialist, LAD: Left Anterior Descending Artery, RCA: Right Coronary Artery, Cx: Circumflex Coronary Artery, UAP: Unstable Angina Pectoris, PCI: Percutaneous Coronary Intervention, *: 2nd Hour

	Ordinal Score (EMS)	Ordinal Score (R)	HEART Score
AUC, (95% CI)	0.913 (0.782 – 0.995)	0.921 (0.795 – 0.993)	0.847 (0.671 – 0.960)
Sensitivity (%), (95% CI)	90.0 (55.5-99.8)	90.0 (55.5-99.8)	80.0 (44.4-97.5)
Specificity (%), (95% CI)	74.4 (57.9-87.0)	84.6 (69.5-94.1)	74.4 (57.9-87.0)
+ LR, (95% CI)	3.5 (2.0-6.2)	5.9 (2.7-12.6)	3.1 (1.7-5.8)
- LR, (95% CI)	0.1 (0.1-0.8)	0.1 (0.1-0.8)	0.3 (0.1-1.0)
PPV (%), (95% CI)	47.4 (33.7-61.5)	60.0 (41.1-76.3)	44.4 (30.1-59.8)
NPV (%), (95% CI)	96.7 (81.7-99.5)	97.1 (83.7-99.5)	93.6 (80.6-98.1)
Accuracy (%), (95% CI)	77.6 (63.4-88.2)	85.7 (72.8-94.1)	75.5 (61.1-86.7)

Table 2. Predictive measures for Ordinal and HEART scores

EMS: Emergency Medicine Specialist, R: Radiologist, AUC: Area Under the Curve, LR: Likelihood Ratio, PPV: Positive Predictive Value, NPV: Negative Predictive Value, CI: Confidence Interval

Discussion

In this cross-sectional study, we found that the simple Ordinal CAC score, assessed by an EMS using thorax CT scans in patients presenting to the ED with chest pain, had high sensitivity and moderate specificity for detecting MACE.

Additionally, the study showed perfect agreement between EMS and radiologists in assessing the simple Ordinal CAC score (ICC: 0.964), indicating that EMS can reliably perform this evaluation.

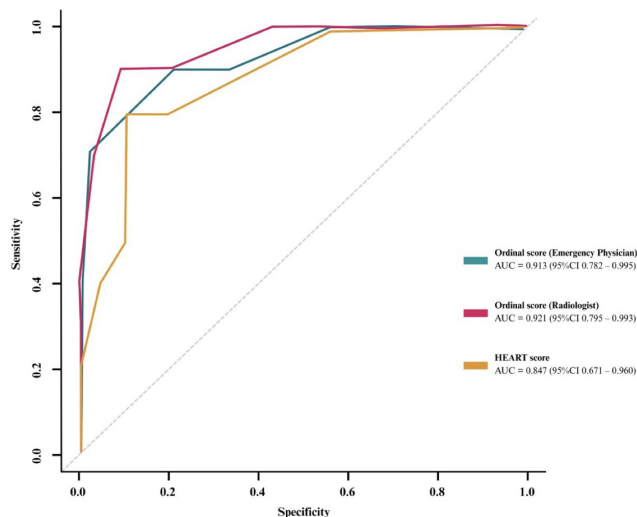


Figure 4. Receiver-operator curves for Ordinal (Emergency Physician and Radiologist) and HEART score. AUC: Area under the curve, CI: Confidence interval

Shemesh et al. investigated the relationship between the simple Ordinal CAC score and cardiovascular disease mortality in thorax CT scans. They found that cardiovascular mortality increased with increasing CAC score and that a simple ordinal score ≥ 4 was a significant predictor of cardiovascular death. Hence, they concluded that visual assessment of CAC on thorax CT scans may provide clinically valuable information about cardiovascular mortality (22). Similarly, in the study by Azour et al., the relationship between the Agatston score and ordinal score for cardiovascular risk prediction was evaluated. A strong correlation was found between Ordinal scores and Agatston scores. It was concluded that the ordinal score calculated by visual assessment and the machine-assisted Agatston score for CAC on routine thorax CT would provide important information about early atherosclerosis, especially in young patients (16). In our study, we evaluated whether CAC presence could predict MACE using a simple Ordinal score. It was observed that a simple Ordinal score of ≥ 4 , calculated by an EMS and a radiologist, had high sensitivity for detecting MACE. Given that a high CAC score is associated with mortality in the literature, we believe our results support this finding.

Unstable angina pectoris (USAP) patients are challenging to detect. Although a negative follow-up troponin and a low HEART score give us some peace of mind about discharge, a negative follow-up troponin and a high HEART score prevent discharge with peace of mind (24). This situation may lead to further investigations and PCI if necessary. The accuracy of the HEART score for patients with suspected ACS was analyzed in the study by Kumar et al. The MACE risk of a low HEART score was very low. It was suggested that these patients could be discharged from the emergency department without an extensive cardiac work-up with appropriate follow-up planning (25). In the review by Long et al., it was concluded that appropriate use of the HEART score can reliably stratify patients into risk strata (26). However, findings from our study suggest that the Ordinal score of CAC demonstrated a significantly higher AUC than the HEART score, indicating superior reliability in risk stratification of

patients with suspected chest pain. This suggests that Ordinal scoring may enhance clinical decision-making, particularly in identifying high-risk patients who may benefit from additional evaluation and intervention.

The literature clearly shows that CAC is a marker of overall atherosclerotic plaque burden. The Agatston score is most commonly used to determine CAC. However, this atherosclerotic plaque burden can also be determined on routine, nongated, non-contrast thorax CT scans using various sequential and visual scoring systems for CAC (27). In the study by Fresno et al., visual calcium assessment in both contrast-enhanced and non-contrast thorax CT scans demonstrated high accuracy and excellent inter-observer agreement in detecting CAC. Visually determined calcium scores have been shown to be a powerful prognostic tool for predicting patients' risk of MACE (28). In our study, a simple Ordinal score for CAC was used, and it has been shown indirectly to be a good indicator of atherosclerotic plaque burden. The results support the literature.

In our study, total calcification was not statistically significant between patients with and without MACE. However, when the vascular structures were analyzed individually, it was observed that calcification in the left anterior coronary artery and the circumflex artery was statistically different between patients with and without MACE. This suggests that evaluating calcification, coded as present or absent, is inadequate for assessing MACE. Visual assessment of calcification is essential for determining MACE.

Siagian et al. found that diabetes, hypertension, and hyperlipidemia were independent risk factors strongly associated with ACS in young women (29). Jamil et al. also found a higher prevalence of diabetes, hyperlipidemia, and smoking history in patients with CAD compared to patients with normal coronary angiograms (30). In our study, comorbidities were not statistically significant between patients with and without MACE. This may be because our current patients already had high-risk factors, resulting in a similar distribution of comorbidities in the patient group we selected.

In our study, the excellent agreement between the EMS and radiologist evaluations suggests that EMS can also perform Ordinal score evaluations. This may be useful for rapid decision-making.

Limitations

This study has several limitations. First, being a single-center study with a relatively small sample size, its findings may not be fully generalizable to broader populations. The relatively small sample size and low number of events may limit the precision and stability of the results. Consequently, the confidence intervals for the calculated AUC values and diagnostic performance metrics may be relatively wide. For these reasons, it may not be possible to fully generalize our results to the wider population. Secondly, selection bias poses a potential problem in cross-sectional studies. Careful attention was paid to the selection of study groups in order to minimize this risk. However, in our study, we excluded the group of patients who had already experienced a MACE at the time of admission (e.g., STEMI patients) and the group of trauma patients whose pain was clearly identified as being trauma-related, treating these two groups as the two

extremes of the spectrum (positive and negative). This decision may have led to selection bias. This may also have influenced our results. Third, tomographic evaluations were performed by only one EMS and one radiologist. While their inter-rater agreement was assessed, the lack of additional independent evaluators makes it difficult to extrapolate these findings to a wider clinical setting. Fourthly, the timeframe accepted for CT scans was defined as scans performed at the time of presentation to the ED or within the past month. There is no clear timeframe in the literature regarding when the coronary plaque develops; the one-month timeframe we chose may have influenced our results. Fifthly, it could not be assessed whether the fact that the CT scans were performed either at the time of the ED presentation or within the last month influenced our results. The assessment of CT scans taken at these different time points may have influenced our results. Finally, the small sample size limited our ability to establish stratified cut-off values for categorizing patients into low, moderate, and high-risk groups. Instead, we relied on a single cut-off, which may have led to an underestimation of the diagnostic performance. Hence, conducting a meaningful subgroup analysis was not feasible, as it could have led to false estimations of results.

To improve the reliability of these findings, future studies with larger, multi-center cohorts are essential.

Conclusion

The simple Ordinal score, assessed by an EMS on thorax CT, has high sensitivity and moderate specificity for detecting MACE in chest pain patients. This suggests that the simple ordinal score can be used as a non-invasive method to identify high-risk patients in conjunction with troponin follow-up.

Conflict of Interest: The authors declare that there is no conflict of interest.

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Authors' Contribution: **MMY:** literature search; study design; legislative applications; data collection; supervision and quality control; statistical data analysis; data interpretation; drafting of the manuscript; writing and critical revision of the manuscript and approved the final version. **AÇ:** literature search; study design; legislative applications; statistical data analysis; drafting of the manuscript; writing and critical revision **ÖY:** data collection; supervision and quality control; study design. **YÇ:** data collection; data interpretation; study design. **EK:** data collection; legislative applications; data interpretation. **FBC:** data collection; supervision and quality control, data interpretation. All authors read and approved the final version of the manuscript

Ethical Approval: This study was approved by the institutional review board and ethics committee (T.C. Recep Tayyip Erdoğan University Non-Interventional Clinical

Research Ethics Committee, number: E-40465587-050.01.04-1257 and ID: 2024/280).

Informed patient consent: Informed consent was obtained from all individual participants included in the study. The principles outlined in the Declaration of Helsinki have been followed.

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