대한응급의학회지 제 33 권 제 2 호
Volume 33, Number 2, April, 2022

□ 원 저 □

Medical

Actual sweating as a significant predict factor of acute coronary syndrome

Suk Ju Youn[1], Woo Ik Choi[1], Sang Chan Jin[1], Jae Cheon Jeon[1], Tae Kwon Kim[1], In-Cheol Kim[2], Sang Hun Lee[1]

[1]Department of Emergency Medicine, [2]Division of Cardiology, Department of Internal Medicine, Cardiovascular Center, Dongsan Medical Center, Keimyung University School of Medicine, Daegu, Korea

Objective: This study aims to identify significant factors such as sweat that can be used as important predictors of acute coronary syndrome (ACS) in patients visiting the emergency department (ED) complaining of chest pain.

Methods: This observational, retrospective, registry-based study conducted from May 2020 to November 2020 evaluated patients who visited the ED due to chest pain. Parameters associated with ACS were investigated, and the clinical characteristics and symptoms were analyzed.

Results: A total of 230 patients visited the ED with chest pain. Of these, 94 (40.9%) were diagnosed with ACS. Univariate regression analysis showed that facial sweating (odds ratio [OR], 2.624; 95% confidence interval [CI], 1.241-5.549; P=0.012) and drench sweating (OR, 3.346; 95% CI, 1.602-6.991; P=0.001) were associated with ACS. Hence, we classified these patients as the actual sweating group. However, the sweaty feeling self-reported by patients with no visible sweat did not correlate with ACS. Multivariate logistic regression analysis showed that age (OR, 1.043; 95% CI, 1.016-1.071; P=0.002), quantum of smoking (OR, 1.023; 95% CI, 1.005-1.041; P=0.010), diastolic blood pressure (OR, 1.028; 95% CI, 1.004-1.049; P=0.009), squeezing chest pain (OR, 2.128; 95% CI, 1.000-4.531; P=0.050), and actual sweating (OR, 2.300; 95% CI, 1.209-4.374; P=0.011) were significantly associated with ACS.

Conclusion: Age, the quantum of smoking, diastolic blood pressure, squeezing chest pain, and actual sweating are useful predictors for ACS diagnosis. Unlike actual sweating, patient-reported sweating is not significantly related to the diagnosis of ACS. The results of this study will be beneficial in predicting ACS to ensure early and emergency medical care in the pre-hospital setting.

Keywords: Acute coronary syndrome; Chest pain; Sweat

INTRODUCTION

Every year, millions of patients visit the emergency department (ED) for acute chest pain and about 10% of them are diagnosed with acute coronary syndrome (ACS), such as ST-segment elevation myocardial infarction (STEMI), non-STEMI (NSTEMI), and unstable angina (UA).[1] Appropriate treatment of these ACS patients is associated with survival, and it is essential to recognize this early and visit the hospital immediately for proper evaluation.[2] However, the causes of chest pain are diverse and it is not easy to diagnose ACS merely by observation of symptoms.

Cardiogenic chest pain is judged by location, pain pattern, duration, and changes in symptoms due to any factor.[3] Accompanying symptoms such as radiating pain, dyspnea, syncope, nausea, and sweating are known to help diagnose ACS in patients.[1] These clinical symptoms cannot be easily judged by observation of the patient's expressions; especially in cases where the patient experiences sweating. Sweating can differ in form for each patient, varying from mild to severe; severe sweating can result in drenching of patient's clothes with sweat.

Sweat is known to be a useful factor in diagnosing ACS in patients with chest pain and has a significant meaning.[4,5] However, in a previous study, only the pres-

책임저자: 이 상 훈
대구광역시 달서구 달구벌대로 1035
계명대학교 동산의료원 응급의학과
Tel: 053-258-7896, Fax: 053-258-6305, E-mail: sanghun@dsmc.or.kr

접수일: 2021년 6월 3일, 1차 교정일: 2021년 8월 3일, 게재승인일: 2021년 8월 17일

Capsule Summary

What is already known in the previous study

Many factors are known to be predictors of acute coronary syndrome (ACS). Of these, sweat is considered an essential predictor. However, the definition of sweat related to ACS was unclear, and there was no grade distinction by severity.

What is new in the current study

Actual sweating, including facial and drenching sweat, was observed to be meaningful in predicting ACS patients. However, merely verbal complaints of sweat by the patients did not correlate with ACS.

ence or absence of sweat confirmed by the patient was used as a criterion for diagnosis; the degree of sweat was not analyzed separately. Therefore, in this study, we used the degree of sweat and other physical examination parameters for diagnosis of ACS in patients who visited the ED with chest pain.

METHODS

This observational, retrospective, registry-based study included all adult patients with chest pain (aged >18 years) who visited the ED of a tertiary hospital from May 2020 to November 2020. The Institutional Review Board of Keimyung University Dongsan Hospital (no. 2021-03-050) approved the study protocol and waived the requirement for prior consent for this retrospective study. Only patients who visited the ED and underwent coronary computed tomography angiography (CCTA) or coronary angiography (CAG) were included in the study. These limited enrollments were done for objective judgment of ACS, as the diagnosis of angina is based on the clinical opinion of various symptoms. The exclusion criteria for the study were as follows: (1) patients whose pain patterns were not recorded on the chart; (2) those who denied any further investigation; (3) those who were difficult to express clearly due to underlying disease; (4) those who had a prior do-not-resuscitate declaration; (5) those transferred from other hospitals after diagnosis; and (6) those with traumatic chest pain (Fig. 1).

For all patients who visited the ED with chest pain, a record was maintained on an electronic medical chart according to the registry form, by a physician. Data were collected for patients' demographics and clinical characteristics, such as age, sex, height, weight, smoking, alcoholism, previous illness disease, and vital signs. We investigated the occurrence of sweat and graded sweat into three categories: (1) only feeling sweating; the patients only feel like they are sweating, but sweat is not actually visible to the medical staff, their family, or the

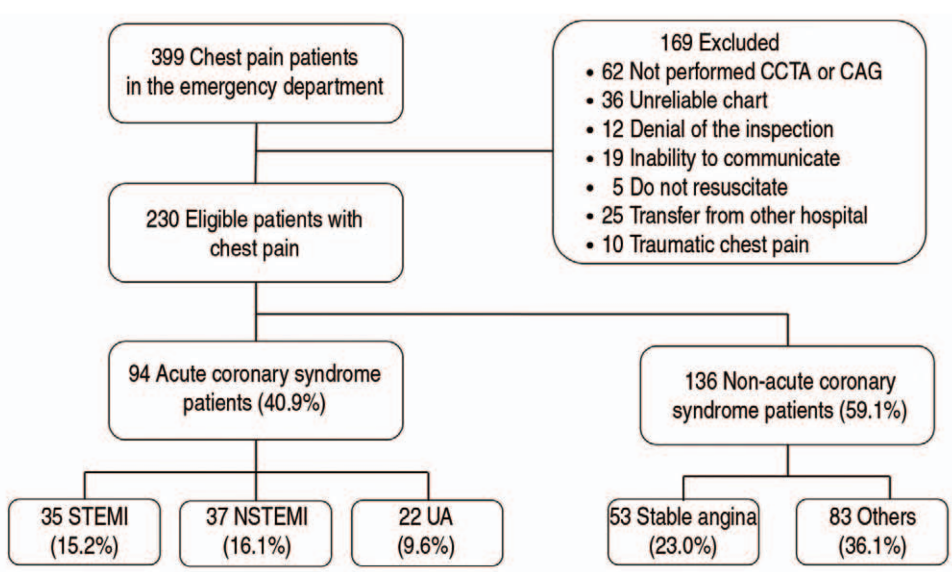

Fig. 1. Flow chart of the study patients. STEMI, ST-segment elevation myocardial infarction; NSTEMI, non-ST-segment elevation myocardial infarction; UA, unstable angina; CCTA, computed tomography angiography; CAG, coronary angiography.

patients; (2) facial sweating; the sweat flows only on the face, not enough for underwear to become wet, and (3) drench sweating; the sweat wets all of the patient's clothes. We collected other information on chest pain features, such as chest pain pattern, duration, radiation to other parts of the body, sudden onset, dyspnea, syncope, palpitation, nausea, vomiting, and exercise-induced exacerbations.

Stable angina was diagnosed as typical substernal chest discomfort induced by exercise or stress and relieved by nitroglycerin (NTG) or resting.[6] UA was diagnosed in patients with angina who had resting onset chest pain, pain duration >20 minutes, non-responsiveness to NTG, or worsening pain pattern.[7] STEMI was defined as typical chest pain with sustained ST elevation and subsequent abnormal elevation of cardiac biomarkers.[8] NSTEMI was defined as cardiac enzyme elevation in the context of UA with absence of electrocardiography criteria for STEMI.[9] ACS such as UA, NSTEMI, and STEMI were diagnosed by board-certified cardiologists on duty based on the above definitions and CCTA and CAG results.[10]

Continuous variables were reported as mean ± standard deviation or median and interquartile range (IQR), with parametric data compared using Student's t-tests and non-parametric data using the Mann-Whitney U test. Categorical variables were reported as numbers (percentage) and compared using the chi-square test with Yates correction or the Fisher exact test, as warranted. Variables with statistical significance were tested using binary logistic regression analysis, and odds ratios (OR) and 95% confidence intervals (CI) were calculated. All statistical analyses were performed using SPSS ver. 25 (IBM Corp., Armonk, NY, USA), with a two-sided P-value <0.05, considered statistically significant.

RESULTS

During the study period, 399 patients visited the ED

Table 1. Demographic and clinical characteristics of the chest pain patients

	Total (n=230)	ACS (n=94)	Non-ACS (n=136)	P-value
Age (yr)	62 (55-72)	64 (58-73)	62 (52-71)	0.006
Male sex	150 (65.2)	64 (68.1)	86 (63.2)	0.269
BMI (m/kg^2)	24 (22-26)	24 (22-26)	24 (22-26)	0.494
Amount of smoking (PY)	10 (0-26)	15 (0-30)	5 (0-21)	0.031
Smoking status				0.05
Smoker	53 (24.7)	28 (31.8)	25 (19.7)	
Stopped smoker	75 (34.9)	28 (31.8)	47 (37)	
Non-smoker	87 (40.5)	32 (36.4)	55 (43.3)	
Alcohol drinker	87 (40.5)	38 (43.2)	49 (38.6)	0.296
Previous illness				
Hypertension	119 (51.7)	52 (55.3)	67 (49.3)	0.221
Diabetes mellitus	67 (29.1)	31 (33.0)	36 (26.5)	0.301
Hyperlipidemia	44 (19.1)	20 (21.3)	24 (17.6)	0.179
Previous CVA	21 (9.1)	12 (12.8)	9 (6.6)	0.088
Chronic heart failure	21 (9.1)	10 (10.6)	11 (8.1)	0.332
CKD	13 (5.7)	7 (7.4)	6 (4.4)	0.243
Prior CAD	62 (27.0)	26 (27.7)	36 (26.5)	0.479
Vital sign				
SBP (mmHg)	140 (120-160)	140 (120-160)	138 (120-158)	0.414
DBP (mmHg)	83 (70-90)	90 (74-90)	80 (70-90)	0.029
Pulse rate (heart rate/min)	81 (70-91)	80 (70-89)	82 (70-93)	0.289
Body temperature (˚C)	36.6 (36.4-36.9)	36.6 (36.3-36.8)	36.7 (36.4-37)	0.440
O_2 saturation	98 (98-99)	98 (98-99)	98 (98-99)	0.446
Heart failure	43 (18.7)	22 (23.4)	21 (15.4)	0.093
Shock state	12 (5.2)	5 (5.3)	7 (5.1)	0.589

ACS, acute coronary syndrome; BMI, body mass index; PY, pack-years; CVA, cerebrovascular accident; CKD, chronic kidney disease; CAD, coronary artery disease; SBP, systolic blood pressure; DBP, diastolic blood pressure with chief complaint of chest pain. With the exception of 169 patients based on exclusion criteria, 230 patients were analyzed, including 150 men (65.2%) and 80 women (34.8%) with a median age of 62 years (range, 22-90 years). Of the 230 patients, 35 were STEMI patients, 37 were NSTEMI patients, and 22 were UA patients, for a total of 94 (40.9%) ACS patients. CAG and CCTA results in ACS patients showed that 12 (5.2%) had three vessels occlusion, 27 (11.7%) had two vessels occlusion, 47 (20.4%) had one vessel occlusion, and eight (3.5%) had no vessel occlusion. No significant differences were observed between ACS and non-ACS patients in height, weight, body mass index, or underlying disease. Alcohol consumption was not significantly different between the two groups, but smoking history was higher in patients with ACS (15 pack-years [PY] vs. 5 PY, P=0.031). No significant difference was observed in the early vital signs of the two groups on visiting the ED, except that the ACS patients had slightly higher diastolic blood pressure (90 mmHg vs. 80 mmHg, P=0.029) (Table 1).

The duration of chest pain, acute onset of pain, NTG response, dyspnea, syncope, palpitation, nausea, and vomiting were not significantly different between the ACS and non-ACS groups. The chest pain pattern showed a differ-

Table 2. Symptoms of the chest pain patients

	Total (n=230)	ACS (n=94)	Non-ACS (n=136)	P-value
Pain pattern				0.004
Pressing	71 (30.9)	34 (36.2)	37 (27.2)	0.097
Squeezing	73 (31.7)	35 (37.2)	38 (27.9)	0.090
Burning	7 (3.0)	3 (3.2)	4 (2.9)	0.601
Stinging	26 (11.3)	9 (9.6)	17 (12.5)	0.320
Other unspecified	53 (23.0)	13 (13.8)	40 (29.4)	0.004
Pain duration				0.348
<5 min	31 (13.5)	11 (11.7)	20 (14.7)	
5-30 min	43 (18.7)	18 (19.1)	25 (18.4)	
30 min-3 hr	87 (37.8)	41 (17.8)	46 (20.0)	
>3 hr	69 (30.0)	24 (25.5)	45 (33.1)	
Sudden onset	179 (77.8)	77 (81.9)	102 (75)	0.140
NTG response	37 (16.7)	17 (18.5)	20 (15.4)	0.333
Sweating	103 (44.8)	55 (58.5)	48 (35.3)	<0.001
Sweating grade				0.003
Only feeling sweating	27 (11.7)	11 (11.7)	16 (11.8)	0.580
Facial sweating	37 (16.1)	20 (21.3)	17 (12.5)	0.056
Drench sweating	39 (17.0)	24 (25.5)	15 (11.0)	0.006
Radiating pain	86 (37.4)	43 (45.7)	43 (31.6)	0.021
Left arm	26 (11.3)	13 (13.8)	13 (9.6)	0.213
Right arm	12 (5.2)	7 (7.4)	5 (3.7)	0.168
Left shoulder	39 (17.0)	19 (20.2)	20 (14.7)	0.180
Right shoulder	18 (7.8)	9 (9.6)	9 (6.6)	0.282
Left neck	16 (7.0)	5 (5.3)	11 (8.1)	0.296
Right neck	10 (4.3)	3 (3.2)	7 (5.1)	0.357
Left jaw	4 (1.7)	4 (4.3)	0	0.027
Right jaw	4 (1.7)	4 (4.3)	0	0.027
Back	22 (9.6)	12 (12.8)	10 (7.4)	0.127
Lower back	2 (0.9)	1 (1.1)	1 (0.7)	0.651
Dyspnea	99 (43.0)	39 (41.5)	60 (44.1)	0.398
Syncope	6 (2.6)	2 (2.1)	4 (2.9)	0.526
Palpitation	12 (5.2)	3 (3.2)	9 (6.6)	0.201
Nausea	42 (18.3)	22 (23.4)	20 (14.7)	0.067
Vomiting	13 (5.7)	7 (7.4)	6 (4.4)	0.243
Exacerbation by exercise	27 (11.7)	16 (17.0)	11 (8.1)	0.032

ACS, acute coronary syndrome; NTG, nitroglycerin.

ence between the two groups, with compression and squeezing pain being observed more often in the ACS group and nonspecific chest pain observed in the non-ACS group (P=0.004). Exacerbation of chest pain from exercise was higher in the ACS group (17% vs. 8.1%, P=0.032). Radiating pain was more common in the ACS group (45.7% vs. 31.6%, P=0.021). Sweat was more pronounced in the ACS patients group (58.5% vs. 35.3%, P<0.001), but the only feeling of sweating, when divided into groups, was not different between the two groups (11.7% vs. 11.8%, P=0.580). Facial (21.3% vs. 12.5%, P=0.056) and drench sweating (25.5% vs. 11.0%, P=0.006) were more frequent in the ACS patient group (Table 2).

Table 3 shows the univariate regression analysis of sweating grade affecting ACS, including facial (OR, 2.624; 95% CI, 1.241-5.549; P=0.012) and drench sweating (OR, 3.346; 95% CI, 1.602-6.991; P=0.001). These facial and drench sweat groups were classified as acutual sweating. To confirm the factors affecting the diagnosis of ACS the following variables were adjusted and analyzed using a multivariable logistic regression analysis: age, sex, amount of smoking, diastolic blood pressure, cerebrovascular accident, chest pain pattern such as pressing, squeezing, and other unspecified, radiating pain, nausea, exacerbation by exercise, and actual sweating. Age (OR, 1.043; 95% CI, 1.016-1.071; P=0.002),

Table 3. Univariate regression analysis of sweating affecting ACS

	Odds ratio	95% Confidence interval	P-value
Non-sweating	Reference		
Only feeling sweating	1.534	0.652-3.608	0.327
Facial sweating	2.624	1.24-5.549	0.012
Drench sweating	3.346	1.602-6.991	0.001

ACS, acute coronary syndrome.

Table 4. Multivariate regression analysis of factors affecting ACS

	Odds ratio	95% Confidence interval	P-value
Age	1.043	1.016-1.071	0.002
Smoking amount (PY)	1.023	1.005-1.041	0.010
Diastolic blood pressure	1.028	1.007-1.049	0.009
Squeezing chest pain	2.128	1.000-4.531	0.050
Actual sweating group	2.300	1.209-4.374	0.011

ACS, acute coronary syndrome; PY, pack years.

Table 5. Diagnosis of the non-acute coronary syndrome patients

Diagnosis	Total (n=136)	Actual sweating (n=32)	Non-actual sweating (n=104)	P-value
Stable angina	53 (39.0)	14 (43.8)	39 (37.5)	0.394
Others				
Arrythmia	10 (7.4)	2 (6.3)	8 (7.7)	0.546
Aortic dissection	3 (2.2)	3 (9.4)	0	0.013
CHF	9 (6.6)	3 (9.4)	6 (5.8)	0.378
Lung disease	7 (5.1)	0	7 (6.7)	0.136
GI disease	13 (9.6)	3 (9.4)	10 (9.6)	0.390
HB disease	3 (2.2)	0	3 (2.9)	0.431
MSK disease	10 (7.4)	1 (3.1)	9 (8.7)	0.250
PSY disease	10 (7.4)	4 (12.5)	6 (5.8)	0.200
Nonspecific	18 (13.2)	2 (6.3)	16 (15.4)	0.133

Values are presented as number (%).
CHF, congestive heart failure; GI, gastrointestinal; HB, hepatobiliary; MSK, musculoskeletal; PSY, psychological.

smoking amount (OR, 1.023; 95% CI, 1.005-1.041; P=0.010), diastolic blood pressure (OR, 1.028; 95% CI, 1.004-1.049; P=0.009), squeezing chest pain (OR, 2.128; 95% CI, 1.000-4.531; P=0.050), and actual sweating (OR, 2.300; 95% CI, 1.209-4.374; P=0.011) were all significantly associated with ACS (Table 4).

The non-ACS patients who complained of chest pain included those with stable angina, arrhythmia, aortic dissection, congestive heart failure, lung disease such as pneumonia and cancer, gastrointestinal disease such as gastroesophageal reflux disease and gastritis, hepatobiliary disease such as cholecystitis and cholangitis, musculoskeletal disease, psychological disease, and other non-specific diseases. In non-ACS patients, actual sweating was significant only in the patients with aortic dissection (9.4% vs. 0%, P=0.013) (Table 5).

DISCUSSION

We studied physical examination findings that could predict ACS and sought to clarify the degree of sweat that was particularly meaningful. It was revealed that age, smoking amount, diastolic blood pressure, squeezing chest pain, and sweating might be useful as predictive factors for ACS diagnosis. Sweating as expressed orally by the patient was not an indicator of ACS; however, sweat that actually flowed down the face or resulted in whole body drenching helped in diagnosis of ACS.

Sweat generates heat loss through evaporation and functions to maintain a normal body temperature of approximately 37˚C.[11] Elevated core body temperature activates the hypothalamic warm-sensitive neurons, which in turn activates the synapse on preganglionic sympathetic neurons that descend along the thoracic spinal cord.[12] These reactions are released to the segmental pathway from the intermediolateral cell column and transmitted to the post-ganglionic non-myelinated C-fibers that pass through the gray ramus, which bind to the peripheral nerves and are transmitted to the skin where they innervate the cholinergic sweat glands.[12] In addition to these thermoregulatory neural mechanisms, non-thermoregulatory sweat is known to be triggered by exercise, baroreceptors, and body fluid status.[12] The mechanism of cardiogenic chest pain has been studied for centuries. However, as with other visceral pain syndromes, it is unclear how pain signals are generated and transmitted by the visceral nerves.[13] With the development of physiological studies, activation of the central nervous system (CNS) region in myocardial ischemia was found to play a major role in pain.[14] The response of the CNS stimulates the sympathetic nerves, and one of the resulting responses is sweat.[15]

Various studies have been conducted to predict ACS in patients with chest pain. The heart score was classified by early prediction of the risk of chest pain by five arguments consisting of history, age, electrocardiogram, risk factor, and troponin.[16] For the HEART score, typical chest pain symptoms were central or left chest pain with radiation to the arms or neck, sweating, or clamminess.[16] The recently developed Emergency Department Assessment of Chest Pain Score (EDACS) is a predictive score for patients with ACS chest pain who visit the ED.[17] The score contains four factors: age, sex, risk factors, and symptoms.[17] Symptoms associated with the diagnosis of ACS include: diaphoresis and pain radiating to the arms or shoulders.[17] According to a previous study, in ACS-related chest pain, sweat was an important factor that could be useful in diagnosis, however, no clear definition or classification was provided. As a result, the physician differentiated the presence or absence of sweat based on the patient’s response only. However, in this study, we found that actual sweating was meaningful; the more severe the sweating was, the more useful it was in diagnosing ACS.

Older patients are known to account for a large proportion of patients with ACS.[18] The EDACS evaluated that the risk of ACS increased from 46 years and above. The risk of ACS was found to increase with increasing age.[17] It is a well-known fact that smoking is a risk factor for cardiovascular problems.[19] It was found that not only with the presence or absence of smoking but also as the amount of smoking increased, the incidence of ACS also increased.[20] High blood pressure is a risk factor for cardiovascular disease, and ACS, in particular, is known to require more attention and must be managed appropriately.[21] In this study, we confirmed that these risk factors could also be useful in diagnosing ACS. Increasing age, greater amount of smoking, and higher diastolic blood pressure resulted in increased likelihood of ACS.

Chest pain can be induced by a variety of causes, and electrocardiograms, imaging tests, blood tests, etc. are used for diagnosis. However, patients with chest pain cannot use these diagnostic tools at the pre-hospital stage or during the initial visit. Therefore, it is necessary to evaluate whether it is an emergency based on the patient's symptoms. The symptom of chest pain, known as the typical ACS symptom, is very diverse and ambiguous, and it is difficult for the general public to predict its association with ACS immediately. However, sweat is not only a physical examination finding that anyone can objectively and easily memorize, but it is also a significant factor in the prediction of ACS. It should be noted that sweat, which is associated with ACS, is defined as the actual flow of sweat and does not include any feelings of sweat that the patient may claim orally.

This study had several limitations. Because this study was a single-center study with relatively few patients, our findings require verification with additional large-scale multicenter research. Each patient's history was recorded by multiple physicians, resulting in ambiguity in the recorded observations. Lastly, as the observations were based on patient's oral claims, difference in individual perspectives might have affected the results of this study.

In conclusion, age, amount of smoking, diastolic blood pressure, squeezing chest pain, and actual sweating are useful predictors of ACS diagnosis. Unlike actual sweating, patient-reported sweating was not significantly related with the diagnosis of ACS. We believe that the results of this study will be beneficial for predicting ACS at the pre-hospital stage or the initial medical care stage.

ORCID

Suk Ju Youn (https://orcid.org/0000-0001-9524-5526)
Woo Ik Choi (https://orcid.org/0000-0001-5407-7626)
Sang Chan Jin (https://orcid.org/0000-0002-4347-0171)
Jae Cheon Jeon (https://orcid.org/0000-0003-3746-3650)
Tae Kwon Kim (https://orcid.org/0000-0003-0756-1620)
In-Cheol Kim (https://orcid.org/0000-0002-5751-2328)
Sang Hun Lee (https://orcid.org/0000-0003-4303-7375)

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

ACKNOWLEDGMENTS

This study was made possible with the 2020 SAMSUNG Eye Hospital Grant.

REFERENCES

1. Fanaroff AC, Rymer JA, Goldstein SA, Simel DL, Newby LK. Does this patient with chest pain have acute coronary syndrome?: the rational clinical examination systematic review. JAMA 2015;314:1955-65.
2. Eisen A, Giugliano RP, Braunwald E. Updates on acute coronary syndrome: a review. JAMA Cardiol 2016;1:718-30.
3. Fox K, Garcia MA, Ardissino D, et al. Guidelines on the management of stable angina pectoris: executive summary: the Task Force on the Management of Stable Angina Pectoris of the European Society of Cardiology. Eur Heart J 2006;27:1341-81.
4. Hess EP, Brison RJ, Perry JJ, et al. Development of a clinical prediction rule for 30-day cardiac events in emergency department patients with chest pain and possible acute coronary syndrome. Ann Emerg Med 2012;59:115-25.
5. Gokhroo RK, Ranwa BL, Kishor K, et al. Sweating: a specific predictor of ST-segment elevation myocardial infarction among the symptoms of acute coronary syndrome: sweating in myocardial infarction (SWIMI) study group. Clin Cardiol 2016;39:90-5.
6. Antman EM, Cohen M, Bernink PJ, et al. The TIMI risk score for unstable angina/non-ST elevation MI: a method for prognostication and therapeutic decision making. JAMA 2000;284:835-42.
7. Anderson JL, Adams CD, Antman EM, et al. ACC/AHA 2007 guidelines for the management of patients with unstable angina/non ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines for the Management of Patients With Unstable Angina/Non ST-Elevation Myocardial Infarction):developed in collaboration with the American College of Emergency Physicians, the Society for Cardiovascular Angiography and Interventions, and the Society of Thoracic Surgeons: endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation and the Society for Academic Emergency Medicine. Circulation 2007;116:e148-304.
8. Thygesen K, Alpert JS, Jaffe AS, et al. Fourth universal definition of myocardial infarction (2018). Eur Heart J

2019;40:237-69.
9. Amsterdam EA, Wenger NK, Brindis RG, et al. 2014 AHA/ACC guideline for the management of patients with non-ST-elevation acute coronary syndromes: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Circulation 2014;130:e344-426.
10. Linde JJ, Kelbaek H, Hansen TF, et al. Coronary CT angiography in patients with non-ST-segment elevation acute coronary syndrome. J Am Coll Cardiol 2020;75:453-63.
11. Baker LB. Physiology of sweat gland function: The roles of sweating and sweat composition in human health. Temperature (Austin) 2019;6:211-59.
12. Shibasaki M, Crandall CG. Mechanisms and controllers of eccrine sweating in humans. Front Biosci (Schol Ed) 2010;2:685-96.
13. Leach A, Fisher M. Myocardial ischaemia and cardiac pain: a mysterious relationship. Br J Pain 2013;7:23-30.
14. Foreman RD, Garrett KM, Blair RW. Mechanisms of cardiac pain. Compr Physiol 2015;5:929-60.
15. Coon EA, Cheshire WP Jr. Sweating disorders. Continuum (Minneap Minn) 2020;26:116-37.
16. Six AJ, Cullen L, Backus BE, et al. The HEART score for the assessment of patients with chest pain in the emergency department: a multinational validation study. Crit Pathw Cardiol 2013;12:121-6.
17. Than M, Flaws D, Sanders S, et al. Development and validation of the Emergency Department Assessment of Chest pain Score and 2 h accelerated diagnostic protocol. Emerg Med Australas 2014;26:34-44.
18. Simms AD, Batin PD, Kurian J, Durham N, Gale CP. Acute coronary syndromes: an old age problem. J Geriatr Cardiol 2012;9:192-6.
19. Panagiotakos DB, Rallidis LS, Pitsavos C, Stefanadis C, Kremastinos D. Cigarette smoking and myocardial infarction in young men and women: a case-control study. Int J Cardiol 2007;116:371-5.
20. Notara V, Panagiotakos DB, Kouroupi S, et al. Smoking determines the 10-year (2004-2014) prognosis in patients with acute coronary syndrome: the GREECS observational study. Tob Induc Dis 2015;13:38.
21. Williams B, Mancia G, Spiering W, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension. Eur Heart J 2018;39:3021-104.