ORIGINAL ARTICLE

Usefulness of limited echocardiography with A-F mnemonic in patients with suspected non-ST-segment elevation acute coronary syndrome

Dorota Sobczyk[1], Krzysztof Nycz[1], Krzysztof Żmudka[1,2]

1 Department of Interventional Cardiology, John Paul II Hospital, Jagiellonian University Medical College, Kraków, Poland
2 Department of Interventional Cardiology, Institute of Cardiology, Jagiellonian University Medical College, Kraków, Poland

KEY WORDS

A-F mnemonic, emergency echocardiography, limited echocardiography, myocardial infarction, non-ST-segment elevation acute coronary syndrome

ABSTRACT

INTRODUCTION When diagnosing the causes of acute chest pain, both acute coronary syndromes (ACSs) and other serious conditions should be considered.

OBJECTIVES The aim of the study was to assess the usefulness of limited transthoracic echocardiography (TTE) with an A-F mnemonic in patients with suspected non-ST-segement elevation ACS (NSTE-ACS) and the effect of TTE on therapeutic decisions.

PATIENTS AND METHODS This retrospective study was conducted at an emergency department for 12 months. The study population consisted of consecutive patients with a preliminary diagnosis of NSTE-ACS. We analyzed demographic data, clinical condition, medical history, electrocardiography, TTE, and the levels of necrotic markers. TTE with the A-F mnemonic was performed within 15 minutes from admission.

RESULTS A total of 916 consecutive patients were enrolled to the study. The diagnosis of ACS was confirmed in 70.19% of the patients. TTE with the A-F mnemonic revealed regional wall motion abnormalities in 74.03% of the ACS group and significant echocardiographic abnormalities in 2.18% of the ACS group and 55.31% of patients without ACS. On the basis of those findings, 4.69% of the patients underwent invasive treatment other than myocardial revascularization. A comparative analysis revealed that patients with ACS were older, more likely to have ST-segment depression, higher levels of necrotic markers, and lower left ventricular ejection fraction, while patients without ACS had more echocardiographic abnormalities in points B-F according to the A-F scheme.

CONCLUSIONS Limited TTE with the A-F mnemonic should be performed in all patients with suspected NSTE-ACS. It allows to confirm ischemia and detect other life-threatening conditions. TTE with the A-F mnemonic covers a sufficient spectrum of cardiac abnormalities and has a significant effect on therapeutic decision making in patients with suspected NSTE-ACS.

Correspondence to:
Dorota Sobczyk, MD, PhD, Krakowski Szpital Specjalistyczny im. Jana Pawła II, ul. Prądnicka 80, 31-202 Kraków, Poland, phone: +48-12-614-31-08, fax: +48-12-614-30-47, e-mail: dorotasobczyk@yahoo.com
Received: August 8, 2014.
Revision accepted: October 10, 2014.
Published online: October 10, 2014.
Conflict of interest: none declared.
Pol Arch Med Wewn. 2014; 124 (12): 688-694

INTRODUCTION Chest pain is one of the most common reasons of visits to the emergency department (ED) in adult population, constituting 10% of all ED admissions.[1] Since coronary artery disease remains the leading cause of death in developed countries,[2] acute coronary syndrome (ACS) in a patient with chest pain seems to be the most likely diagnosis. However, the percentage of ED visits for chest pain results in a diagnosis of ACS only in about 50% of the admitted patients.[1]

The algorithm of chest pain management contains physical examination, clinical presentation, medical history, risk profile assessment, electrocardiography (ECG), laboratory tests, and noninvasive imaging.[2-6] ECG enables to diagnose ACS with persistent ST-segment elevation (STE-ACS), which requires a prompt invasive strategy.[3,7-9] However, the working diagnosis of non-ST-segment elevation ACS (NSTE-ACS) is a rule-out diagnosis based on the lack of persistent STE

TABLE 1 Description of the mnemonic A-F algorithm (modified from: Sobczyk and Andruszkiewicz[12])

Letter	Description	Clinical question
A	aorta	Is aortic dilatation/aneurysm present?
		Is aortic dissection present?
B	both ventricles	Is right ventricular overload present?
C	contractility	Is global left ventricular contractility impaired?
		Are there any left ventricular regional wall motion abnormalities?
		Is right ventricular contractility impaired?
D	dimensions	Are there any abnormal dimensions?
E	effusion	Is pericardial effusion present?
		Are there any signs of cardiac tamponade?
		Is pleural effusion present?
F	further abnormalities	Are there any other abnormalities not listed above?

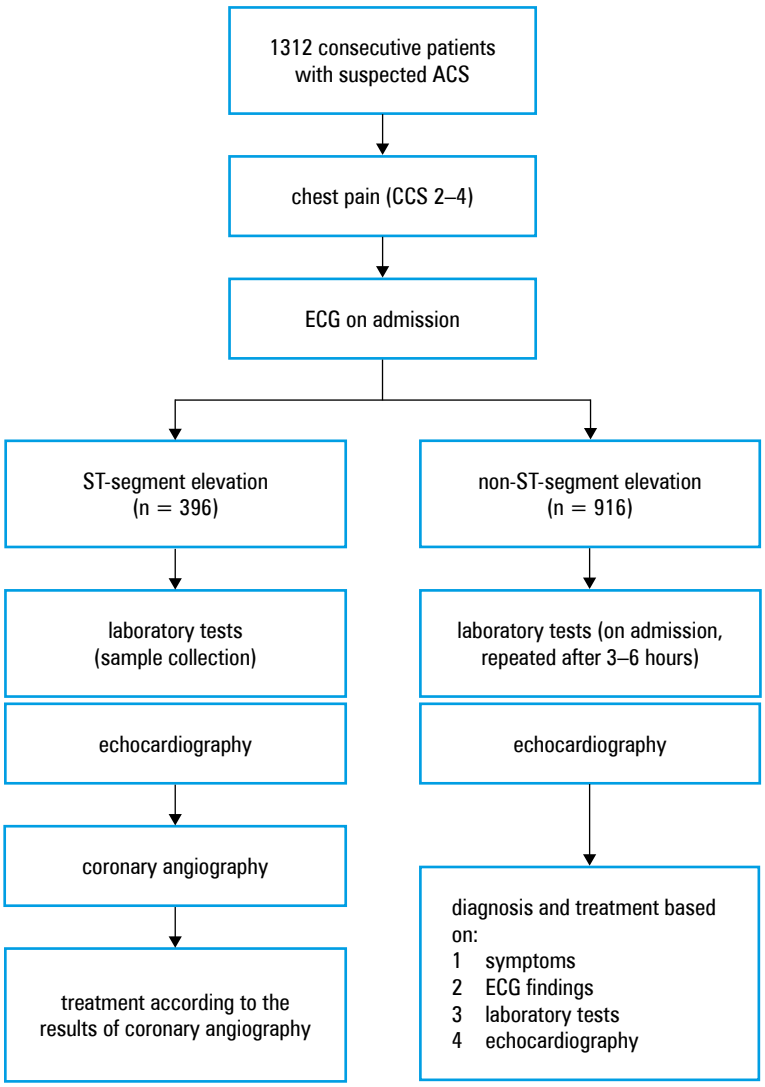

FIGURE Flow chart of patients in the study
Abbreviations: ACS – acute coronary syndrome, CCS – Canadian Cardiovascular Society, ECG – electrocardiography

on ECG.[4] The wide spectrum of clinical symptoms and ECG changes in suspected NSTE-ACS makes the final diagnosis challenging.[5] Moreover, it should be emphasized that several cardiac and noncardiac conditions may mimic NSTE-ACS.[4] Thus, diagnosing the cause of acute chest pain in the ED setting requires a comprehensive approach and should consider not only ACS but also other potentially serious conditions (eg, acute aortic syndrome, acute pulmonary embolism, pericardial effusion, and valvular disease).

Echocardiography enables to perform an anatomical and physiological assessment of the heart at bedside, thus allowing a rapid diagnosis and triage of patients presenting to the ED with chest pain or dyspnea.[6] However, the full echocardiographic examination is time-consuming and requires relevant experience in echocardiography. We have recently introduced and implemented an A-F mnemonic into everyday ED practice, that is, a limited, simplified echocardiographic algorithm, targeting the most common life-threatening pathologies and easy to learn by a nonspecialist during a short training.[10] Its usefulness and reproducibility were validated in patients with suspected ACS.

We performed this study to evaluate the usefulness of limited transthoracic echocardiography (TTE) with the A-F mnemonic in emergency patients with suspected NSTE-ACS and to assess the effect of limited TTE findings on therapeutic decisions.

PATIENTS AND METHODS This retrospective study was approved by the Bioethics Committee and the Administration Office of John Paul II Hospital in Kraków, Poland (ref. number 792/2014). We examined the medical data of the patients transferred to the Emergency Department of John Paul II Hospital over a 12-month period.

We evaluated all admitted patients with a preliminary diagnosis of ACS made before hospital admission on the basis of typical clinical symptoms and ECG findings. On admission, all patients underwent the following assessment: physical examination, clinical condition according to both Canadian Cardiovascular Society and New York Heart Association classifications, detailed medical history, ECG, blood tests for biomarkers of myocardial ischemia, and limited TTE. The exclusion criteria were as follows: age <18 years, persistent STE on admission ECG, and difficult acoustic window resulting in inability to obtain interpretable ultrasound images.

ECG was performed within 5 minutes after the admission to the ED and repeated in 15-minutes intervals in symptomatic patients with an initial nondiagnostic ECG and during every recurrence of symptoms. The ECG recording included: standard 12-leads, right precordial leads (V_3R, V_4R), and posterior leads (V_7-V_9) as appropriate. STE was measured at the J point and was considered present when found in 2 contiguous leads and ≥0.25 mV in men younger than 40 years, ≥0.2 mV in men older than 40 years, ≥0.15 mV in women in leads V_2-V_3 and ≥0.1 mV in other leads (in the absence of left ventricular hypertrophy or left bundle branch block).[2]

Bedside TTE was performed within the first 15 minutes after admission by a resident on call with a basic skill in TTE (at least 50 examinations). TTE images were interpreted with a simplified

TABLE 2 Characteristics of the study population (n = 916)

Characteristic		Value
age, y		67.88 ±12.41
male sex		581 (63.4)
CCS class		3.23 ±0.76
NYHA class		1.67 ±0.97
concomitant diagnosis	prior myocardial infarction	219 (23.9)
	prior PCI	213 (23.2)
	prior CABG	63 (6.9)
	prior AVR	11 (1.2)
prehospital cardiac arrest		41 (4.5)
ECG changes on admission	ST-segment depression	494 (53.9)
	old Q/QS complex	115 (12.5)
	negative T waves	137 (14.9)
	LBBB	45 (4.9)
	LAH	24 (2.6)
	RBBB	35 (3.8)
	atrial fibrillation	58 (6.3)
	ventricular stimulation	16 (1.7)
	advanced atrioventricular block	3 (0.3)
hsTnT, ng/ml		0.33 ±0.63
CK, U/l		341.79 ±852.63
CK-MB, U/l		35.35 ±47.57
echocardiographic abnormalities	A	51 (5.6)
	B	36 (3.9)
	C	550 (60)
	D	259 (28.3)
	E	50 (5.4)
	F	193 (21.1)
LVEF, %		47.53 ±13.87

Data are presented as mean ± standard deviation or number (percentage).

Abbreviations: AVR – aortic valve replacement, CABG – coronary artery bypass grafting, CK – creatinine kinase, CK-MB – cardiac isoenzyme of creatinine kinase, hsTnT – high-sensitivity troponin T, LAH – left anterior hemiblock, LBBB – left bundle branch block, LVEF – left ventricular ejection fraction, NYHA – New York Heart Association, PCI – percutaneous coronary intervention, RBBB – right bundle branch block, others – see FIGURE

A-F mnemonic, introduced in our ED to standardize bedside cardiac examination. All residents underwent a minimum of 30-minute didactic and 1-hour structured hands-on dedicated practice with the scheme. In the A-F mnemonic, consecutive letters of the alphabet represent a particular anatomical structure or measure of cardiac function: A, aorta; B, both ventricles; C, contractility; D, dimensions; E, effusion; F, further abnormalities (TABLE 1). The examinations were conducted with a portable ultrasound system equipped with a 1-5 MHz transthoracic phased-array transducer (Vivid I, GE Healthcare, United States, and CX 50, Philips, Eindhoven, The Netherlands). The heart was visualized in 5 basic echocardiographic views: parasternal long axis, parasternal short axis, apical 4-chamber, apical 2-chamber, and subcostal (additional views were used when appropriate). All studies were recorded as digital 10-second video clips and reviewed within 24 hours by a consultant cardiologist.

Blood samples were collected for the plasma levels of the markers of myocardial necrosis: creatine kinase (CK), cardiac isoenzyme of creatine kinase (CK-MB) and high-sensitivity troponin T (hsTnT), at the time of admission and, if necessary, by repeated measurements every 3 to 6 hours within the first day of hospitalization. Blood tests were assayed by routine automated laboratory techniques (Cobas System 6000, Roche Diagnostics GmbH, Manheim, Germany). All biochemical analyses were performed in the central hospital laboratory, certified with cardiac and clinical chemistry program by RIQAS (Randox International Quality Assessment Scheme, United Kingdom).

Statistical analysis was performed using the STATISTICA v 8.0 software (Statsoft, Tulsa, Oklahoma, United States). Numerical data were expressed as mean values ± standard deviation. Comparative analysis included patients with confirmed ACS and those with unconfirmed ACS. After checking the homogeneity of variance, the comparisons between both groups were performed with the χ^2 test and t test for independent variables, as appropriate. A P value of 0.05 was considered statistically significant. A positive predictive value (PPV) and odds ratio (OR) ± standard error were calculated for all echocardiographic findings.

RESULTS Between January 1, 2013, and December 31, 2013, a total of 1312 patients were admitted to the ED with a preliminary diagnosis of ACS. ECG on admission revealed STE in 396 patients (30.18%), who were directly transferred for coronary angiography (without waiting for laboratory test results and regardless of the presence of regional wall motion abnormalities on TTE). We finally enrolled 916 patients to the study (581 men; age, 21–95 years; mean age, 67.88 ±12.41 years) without STE on admission ECG (FIGURE). Baseline demographic, clinical, and echocardiographic data are shown in TABLE 2.

All patients experienced typical chest pain at rest before hospitalization, while in 40.1% of the patients, it was still present on admission. Dyspnea was observed in 38.8% of the patients. ECG on admission revealed typical ST-T changes in 68.9% of the patients (ST-segment depression, negative T waves). hsTnT levels were higher than the 99th percentile of the upper range limit in 84.3% of the patients, exceeding 3 times the upper range limit in 63.1% of the cases (TABLE 2).

A triad of symptoms included chest pain, dynamic ST-T changes, and positive hsTnT was present in 553 patients (60.4%). However, in 87 of those patients (15.7%,) the cause of this diagnostic constellation was other than ACS.

The final diagnosis of myocardial infarction without persistent STE (NSTEMI) or unstable angina was established according to the recent clinical guidelines (the group with confirmed ACS). The

TABLE 3 Final diagnosis of patients admitted with the primary diagnosis of non-ST-segment elevation acute coronary syndrome (n = 916)

Final diagnosis	Number of patients (%)	Typical echocardiographic findings
confirmed ACS	635 (69.3)	476 (74.9)
NSTEMI	543 (85.5)	426 (78.4)
unstable angina	92 (14.5)	33 (35.8)
additional diagnosis in NSTEMI	17 (2.7)	17 (100)
moderate/severe aortic stenosis	11 (1.7)	16 (100)
severe mitral regurgitation	3 (0.5)	3 (100)
decompensated CHF	2 (0.3)	2 (100)
pericardial effusion	1 (0.2)	1 (100)
unconfirmed ACS	281 (30.1)	151 (55.3)
Takotsubo cardiomyopathy	17 (6)	17 (100)
decompensated CHF	51 (18.1)	51 (100)
stable CAD	35 (12.5)	0 (0)
acute pulmonary embolism	21 (7.5)	20 (95.2)
aortic valve disease	15 (5.3)	15 (100)
myocarditis	10 (3.6)	8 (80)
tachycardia (AF, SVT)	10 (3.6)	8 (80)
pericarditis	8 (2.8)	8 (100)
Prinzmetal angina	8 (2.8)	8 (100)
pneumonia with pleuritis	6 (2.1)	4 (66.6)
mitral valve disease	5 (1.8)	5 (100)
aortic dissection	5 (1.8)	5 (100)
hypertensive crisis	6 (2.1)	6 (100)
exacerbated COPD	4 (1.4)	4 (100)
HOCM	4 (1.4)	4 (100)
cardiac tamponade	3 (1.1)	3 (100)
ventricular septal defect	2 (0.7)	2 (100)
hypovelemic shock	1 (0.3)	1 (100)
infective endocarditis associated with pacemaker electrode	1 (0.3)	1 (100)
perivalvular leak in AVR	1 (0.3)	1 (100)
lung tumor	1 (0.3)	0 (0)
acute pancreatitis	1 (0.3)	0 (0)
exacerbated polimyositis	1 (0.3)	0 (0)
other	71 (25.3)	0 (0)

Data are presented as number (percentage).

Abbreviations: AF – atrial fibrillation, CAD – coronary artery disease, CHF – congestive heart failure, COPD – chronic obstructive pulmonary disease, HOCM – hypertrophic obstructive cardiomyopathy, NSTEMI – non-ST-segment elevation myocardial infarction, SVT – supraventricular tachycardia, others – see **TABLE 2** and **FIGURE**

diagnosis of ACS was finally confirmed in 69.3% of the patients, with the prevalence of NSTEMI (85.5%). The preliminary diagnosis of NSTE-ACS was not confirmed in 30.1% of the patients (the group with unconfirmed ACS), with a wide spectrum of underlying pathologies (**TABLE 3**). Coronary angiography was performed in 93.2% of the patients and 60.3% had subsequent coronary revascularization (**TABLE 4**).

Limited TTE performed on admission showed regional wall motion abnormalities (RWMAs), with normal wall thickness and no features of postinfarction scar, in 77.1% of the ACS group, additionally enhancing the probability of ACS. Bedside TTE revealed a significant structural heart abnormality in 2.7% of patients with NSTEMI. Based on TTE findings, all of them underwent coronary artery bypass grafting with an additional target procedure (aortic valve replacement, mitral annuloplasty) (**TABLE 4**). TTE with the A-F mnemonic showed significant echocardiographic abnormalities in 55.3% of patients without ACS (**TABLE 3**). On the basis of these findings, 29 patients (10.3%) underwent invasive treatment: aortic valve replacement, mitral annuloplasty, aortic alloplasty, decompression of tamponade, VSD closure, fibrinolysis, or removal of an infected pacemaker electrode (**TABLE 4**).

A comparative analysis revealed that patients with ACS were older, predominantly male, and more likely to have ST-segment depression, had higher levels of hsTnT and CK-MB biomarkers, lower left ventricular ejection fraction, and significant coronary artery stenosis requiring coronary revascularization, while patients without ACS had more echocardiographic abnormalities in points B-F according to the A-F mnemonic (**TABLE 5**). Echocardiographic evidence of presumably new regional wall motion abnormalities was a strong predictor of NSTE-ACS (PPV, 0.93; OR, 15.9 ±0.13). The presence of any abnormalities in points A (PPV, 0.79; OR >1), B (PPV, 0.79; OR, 4.9 ±0.07), D (PPV, 0.83; OR >1), E (PPV, 0.81; OR 6.02 ±0.07), and F (PPV, 0.83; OR >1) suggested a diagnosis other than ACS.

DISCUSSION The majority of patients presenting with chest pain and persistent STE develop STEMI.[3] Since the prevention of delay is critical in STEMI, in all patients with a suspicion of myocardial ischemia and STE on ECG, emergency coronary angiography and subsequent revascularization should be initiated as soon as possible.[2,3] NSTE-ACS, with an increasing incidence, exceeding that of STE-ACS in the last decades, represents a wide variety of clinical symptoms and ECG changes.[4] Moreover, there are many other chronic and acute conditions that can resemble typical angina and are associated with both ECG changes and biomarker elevation.[4] It is interesting that in our selected population of patients with typical clinical symptoms and ECG findings, the diagnosis of ACS was confirmed in 69.3% of the patients. In almost 16% of patients presenting with a diagnostic triad of chest pain, ST-T changes, and hsTnT elevation, the preliminary diagnosis of ACS was eventually not confirmed.

A high prevalence of other life-threatening cardiac and noncardiac conditions mimicking the clinical presentation of NSTE-ACS prompts the implementation of additional imaging tests to the management of patients with suspected NSTE-ACS.[5,6,11] Echocardiography appears to be the most useful diagnostic modality in the first-line emergency assessment of patients with suspected NSTE-ACS.[4,6,11-13] This noninvasive method is rapid, safe, portable, and readily available

TABLE 4 Different diagnostic tests and treatments in the study population (n = 916)

Management	Number of patients (%)
coronary angiography	854 (93.2)
computed tomography	20 (2.2)
PCI	482 (52.6)
conservative treatment	352 (38.4)
CABG	70 (7.6)
AVR	22 (2.4)
referral for ICD/CRT-D	10 (1.1)
fibrynolysis	5 (0.5)
mitral annuloplasty	5 (0.5)
aortic alloplasty	5 (0.5)
percutaneous decompression of tamponade	3 (0.3)
VSD closure	2 (0.2)
removal of infected pacemaker electrode	1 (0.1)

Abbreviations: CRT-D – cardiac resynchronization therapy with defibrillator function, ICD – implantable cardioverter-defibrillator, PCI – percutaneous coronary intervention, VSD – ventricular septal defect, others – see TABLES 2 and 3

TABLE 5 Comparison between the groups with confirmed acute coronary syndrome and without acute coronary syndrome

Variable		Confirmed ACS (n = 635)	Unconfirmed ACS (n = 281)	*P* value
age, y		68.95 ±11.22	65.44 ±14.56	0.01
male sex		420 (66.1)	160 (56.9)	0.01
CCS class		3.38 ±0.69	2.89 ±0.78	<0.01
NYHA class		1.56 ±0.91	1.92 ±1.07	<0.01
hsTnT, ng/ml		0.38 ±0.67	0.19 ±0.47	<0.01
hsTnT >99th percentile URL		582 (91.6)	190 (67.6)	0.001
hsTnT >3 × 99th percentile URL		457 (71.9)	121 (43.1)	<0.01
CK, U/l		359.47 ±629.04	299.40 ±1226.79	0.70
CK-MB, U/l		40.45 ±54.05	23.36 ±22.65	<0.01
prior MI		163 (25.7)	56 (19.9)	0.99
prior PCI		154 (24.2)	59 (21)	0.35
prior CABG		53 (8.3)	10 (3.6)	0.14
cardiac arrest		27 (3.9)	14 (5)	0.55
ST-segment depression		415 (65.4)	79 (28.1)	<0.01
coronary artery stenosis		574 (90.4)	24 (8.5)	<0.01
echocardiographic abnormalities	A	33 (5.2)	18 (6.4)	0.07
	B	15 (2.4)	21 (7.5)	<0.01
	C	490 (77.1)	60 (21.4)	<0.01
	D	152 (23.9)	107 (38.1)	<0.01
	E	14 (2.2)	36 (12.8)	<0.01
	F	109 (17.2)	84 (29.9)	<0.01
	A+B+E+F	142 (22.4)	109 (38.8)	<0.01
LVEF, %		45.95 ±12.32	48.79 ±16.90	0.001

Data are presented as mean ± standard deviation or number (percentage).

Abbreviations: MI – myocardial infarction, URL – upper range limit, others – see TABLES 2 and 4 and FIGURE

in the ED. In addition, it requires no radiation or contrast media, and does not influence the hemodynamic state or disturb preparation for invasive procedures. In particular, the introduction of the pocket-sized, personal ultrasound tools revolutionized the reality of EDs by converting echocardiography into a shortened, point-of-care procedure. All recent clinical guidelines for the diagnosis and management of myocardial infarction, emphasize the role of TTE as the initial imaging modality in patients with acute chest pain.[2-4] Beside the assessment of left ventricular systolic function and evidence of RWMAs, TTE facilitates a differential diagnosis of chest pain.[2-4,11] It identifies several life-threatening conditions that resemble NSTE-ACS and require an urgent targeted treatment.[11-16,17]

However, in everyday practice, the full echocardiographic examination seems too complicated, extensive, and time-consuming in patients with acute chest pain. Moreover, the full reading and report contain a lot of unnecessary details that can obscure the clinical decision making. From the perspective of the ED setting, in suspected NSTE-ACS, echocardiography should evaluate the probability of myocardial ischemia by the detection of new RWMAs, assess the global left ventricular systolic function (as the predictor of outcome), and identify (or exclude) other serious causes of chest pain and dyspnea.

Several studies tested the usefulness of TTE in ED patients with suspected ACS and its effect on further decision making.[18-21] In their prospective case series, Ferrada et al.[15] validated the use of point-of-care echocardiography in risk stratification of patients with ACS. Kontos et al.[20] confirmed the hypothesis that TTE performed in ED patients with ischemia identifies a high-risk population and has a significant incremental value when added to clinical and ECG variables. Levitt et al.[21] reported the significance of the level of physician's confidence and medical decision making concerning patients with suspected cardiovascular pathology in the ED. In the study of Kimura et al.,[22] cardiac ultrasound detected significant findings misdiagnosed on an initial clinical evaluation and provided prognostic data regarding the length of hospital stay.

Our present study reveals the validity of TTE with the mnemonic A-F algorithm in patients with suspected NSTE-ACS. It should be emphasized that all echocardiographic examinations performed using the simplified A-F algorithm were repeated within 24 hours by a cardiology consultant. All digital clips recorded and described by residents based on the A-F mnemonic were reviewed by investigators blinded to the final diagnosis. The comparison of both examinations confirmed the 100% coincidence of A-F-based and full reports.

Limited TTE with the A-F mnemonic revealed RWMAs in 77% of the ACS group. In our ED practice, the combination of a typical clinical presentation, ECG changes, and new RWMAs on echocardiography, strongly suggests NSTE-ACS and prompts further coronary angiography. In 7.75% of the patients from our study group, the following life-threatening abnormalities other than ACS

were identified with TTE: acute aortic dissection, acute pulmonary embolism, tamponade, severe aortic stenosis, severe mitral regurgitation, hypertrophic cardiomyopathy with left ventricular outflow tract obstruction, ventricular septal defect, perivalvular leak in mechanical aortic prosthesis, infective endocarditis associated with a pacemaker electrode, and hypovolemic shock. On the basis of these findings, 14 patients (2.7%) with ACS and 29 (10.3%) without ACS underwent target invasive treatment. The comparative analysis of the groups with confirmed and unconfirmed ACS also highlighted the importance of echocardiographic findings according to the A-F interpretation scheme in a differential diagnosis of patients with suspected NSTE-ACS. It appears that limited TTE with the A-F mnemonic allows to diagnose all cardiac pathologies crucial for the management of patients with suspected NSTE-ACS.

We conclude that suspected NSTE-ACS covers a significant number of other cardiac and noncardiac conditions mimicking ACS. Limited echocardiography with the A-F mnemonic should be performed in all patients with suspected NSTE-ACS because it allows the detection of life-threatening conditions other than MI, requiring targeted treatment. Moreover, the presence of regional wall motion abnormalities (especially if new) supports the diagnosis of ongoing ischemia. Limited TTE with the mnemonic A-F algorithm appears to cover a sufficient spectrum of morphological and functional cardiac abnormalities and has a significant effect on therapeutic decision making in patients with suspected NSTE-ACS.

Limitations The limitation of the study is a retrospective analysis. We examined a selected group of patients transferred to our ED with the preliminary diagnosis of NSTE-ACS made by health care providers before hospital admission: ambulance paramedics, general practitioners, or general district EDs.

Acknowledgments We would like to express our gratitude to Andrzej Kot, PhD, from the University of Science and Technology in Kraków, Faculty of Mechanical Engineering and Robotics, Automatic Control Department, for his help, useful comments, and contribution to our study and statistical analyses.

Contribution statement DS conceived the idea of the study. DS and KN contributed to the design of the research. DS and KN were involved in data collection. All authors analyzed the data. All authors edited and approved the final version of the manuscript.

REFERENCES

1 Bhuiya FA, Pitts SR, McCaig LF. Emergency department visits for chest pain and abdominal pain: United States 1999-2008. NHS Sata Brief. 2010; 43.

2 Thygesen K, Alpert JS, Jaffe AS, et al. Third universal definition of myocardial infarction. Eur Heart J. 2012; 33: 2551-2567.

3 Steg GP, James SK, Atar D, et al. ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. The Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology. Eur Heart J. 2012; 33: 2569-2619.

4 Hamm CW, Bassand J-P, Agewall S, et al. ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. The Task Force for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation of European Society of Cardiology. Eur Heart J. 2011; 32: 2999-3054.

5 Sielski J, Janion-Sadowska A, Sadowski M, et al. Differences in presentation, treatment and prognosis in elderly patients with non-ST-segment elevation myocardial infarction. Pol Arch Med Wewn. 2012; 122: 253-261.

6 Cheitlin MD, Armstrong WF, Aurigemma GP, et al. ACC/AHA/ASE 2003 Guideline update for the clinical application of echocardiography: summary article. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/ASE Committee to Update the 1997 Guidelines for the Clinical Application of Echocardiography). Circulation. 2003; 108: 1146-1162.

7 Rude RE, Poole WK, Muller JE, et al. Electrocardiographic and clinical criteria for recognition of acute myocardial infarction based on analysis of 3697 patients. Am J Cardiol. 1983; 52: 936-942.

8 Elzbieciak M, Wita K, Grabka M, et al. Effect of postconditioning on infarction size, adverse left ventricular remodeling, and improvement in left ventricular systolic function in patients with first anterior ST-segment elevation myocardial infarction. Pol Arch Med Wewn. 2013; 123: 268-276.

9 Rechcinski T, Jasinska A, Peruga JZ, et al. Presence of coronary collaterals in ST-elevation myocardial infarction patients does not affect long-term outcome. Pol Arch Med Wewn. 2013; 123: 29-37.

10 Shah BN, Ahmadvazir S, Pabla JS, et al. The role of urgent transthoracic echocardiography in the evaluation of patients with acute chest pain. Eur J Emerg Med. 2012; 19: 227-283.

11 [Myocardial infarction]. http://www.criticalusg.pl/pl/echo/tte/patologie/zawa-minia-sercowego. Accessed October 15, 2014. Polish.

12 Sobczyk D, Andruszkiewicz P. Simple mnemonic for focused cardiac ultrasound examination in an emergency. Eur J Anaesthesiol. 2014; 31: 505-506.

13 Labovitz A, Noble VE, Bierig M, et al. Focused cardiac ultrasound in the emergent setting: a consensus statement of the American Society of Echocardiography and American College of Emergency Physicians. JASE. 2010; 23: 1225-1230.

14 Arntfield RT, Millington SJ. Point of care cardiac ultrasound applications in the emergency department and intensive care unit – a review. Current Cardiol Rev. 2012; 8: 98-108.

15 Ferrada P, Evans D, Wolfe L, et al. Findings of a randomized controlled trial using limited transthoracic echocardiogram (LTTE) as a hemodynamic monitoring tool in the trauma bay. J Trauma Acute Care Surg. 2013; 76: 31-37.

16 Ferrada P, Arand RJ, Whelan J, et al. Limited transthoracic echocardiogram: so easy any trauma attending can do it. J Trauma. 2011; 71: 1327-1331.

17 Kochanowski J, Pintkowski R, Grabowski M, et al. Utility of stress echocardiography in selecting the optimal mitral valve procedure in patients with severe ischemic mitral regurgitation undergoing coronary artery bypass grafting. Pol Arch Med Wewn. 2012; 122: 217-225.

18 Pershad J, Myers S, Plouman C, et al. Bedside limited echocardiography by the emergency physician is accurate during evaluation of the critically ill patients. Pediatrics. 2004; 114: e667-e671.

19 Frenkel O, Riguzzi C, Nagdev A. Identification of high-risk patients with acute coronary syndrome using point-of-care echocardiography in the ED. Am J Emerg Med. 2014; 32: 670-672.

20 Kontos MC, Arrowood JA, Paulsen WJ, Nixon JV. Early echocardiography can predict cardiac events in emergency department patients with chest pain. An Emerg Med. 1998; 31: 5.

21 Levitt MA, Jan BA. The effect of real time 2-D-echocardiography on medical decision-making in the emergency department. J Emerg Med. 2002; 22: 229-233.

22 Kimura BJ, Bocchicchio M, Willis CL, DeMaria AN. Screening cardiac ultrasonographic examination in patients with suspected cardiac disease in the emergency department. Am Heart J. 2001; 142: 324-330.

ARTYKUŁ ORYGINALNY

Przydatność ograniczonego badania echokardiograficznego wg schematu A-F u pacjentów z podejrzeniem ostrego zespołu wieńcowego bez uniesienia odcinka ST

Dorota Sobczyk[1], Krzysztof Nycz[1], Krzysztof Żmudka[1,2]

1 Oddział Kliniczny Kardiologii Interwencyjnej, Krakowski Szpital Specjalistyczny im. Jana Pawła II, Uniwersytet Jagielloński, Collegium Medicum, Kraków
2 Klinika Kardiologii Interwencyjnej, Instytut Kardiologii, Uniwersytet Jagielloński, Collegium Medicum, Kraków

SŁOWA KLUCZOWE

echokardiografia stanów nagłych, ograniczone badanie echokardiograficzne, ostry zespół wieńcowy bez uniesienia odcinka ST, schemat A-F, zawał mięśnia sercowego

STRESZCZENIE

WPROWADZENIE W diagnostyce przyczyn ostrego bólu w klatce piersiowej powinno się brać pod uwagę zarówno ostre zespoły wieńcowe (*acute coronary syndrome* – ACS) jak i inne potencjalnie groźne schorzenia.
CELE Celem badania była ocena przydatności ograniczonego przezklatkowego badania echokardiograficznego (*transthoracic echocardiography* – TTE) z wykorzystaniem schematu A-F u pacjentów z podejrzewanym ACS bez uniesienia odcinka ST (*non-ST-segment elevation* – NSTE-ACS) oraz wpływu TTE na podejmowanie decyzji terapeutycznych.
PACJENCI I METODY Badanie retrospektywne przeprowadzono w ciągu 12 miesięcy w izbie przyjęć. Grupę badaną stanowili kolejni pacjenci ze wstępnym rozpoznaniem NSTE-ACS. Analizowano dane demograficzne, stan kliniczny, dane z wywiadu, EKG, TTE oraz poziomy enzymów sercowych. TTE z wykorzystaniem schematu A-F było wykonywane w ciągu 15 minut od przyjęcia.
WYNIKI Do badania włączono 916 kolejnych chorych. ACS potwierdzono u 70,19% pacjentów. TTE z użyciem schematu A-F ujawniło obecność odcinkowych zaburzeń kurczliwości u 74,03% chorych z ACS oraz istotne nieprawidłowości echokardiograficzne u 2,18% pacjentów z ACS i 55,31% bez ACS. Na tej podstawie, 4,69% pacjentów zostało poddanych leczeniu inwazyjnemu innemu niż rewaskularyzacja mięśnia sercowego. Analiza porównawcza wykazała, że chorzy z ACS byli starsi, mieli częściej obniżenie odcinka ST, wyższe poziomy enzymów sercowych i niższą frakcję wyrzutową lewej komory, natomiast w grupie chorych bez ACS obserwowano więcej nieprawidłowości echokardiograficznych w punktach B-F wg schematu A-F.
WNIOSKI Ograniczone TTE wg schematu A-F powinno być wykonywane u wszystkich pacjentów z podejrzeniem NSTE-ACS. Badanie pozwala na potwierdzenie niedokrwienia i wykrycie innych groźnych chorób. TTE wg schematu A-F obejmuje wystarczające spektrum nieprawidłowości kardiologicznych i ma znaczący wpływ na podejmowanie decyzji terapeutycznych u pacjentów z podejrzeniem NSTE-ACS.

Adres do korespondencji:
dr med. Dorota Sobczyk, Krakowski Szpital Specjalistyczny im. Jana Pawła II, ul. Prądnicka 80, 31-202 Kraków, tel.: 12-614-31-08, fax: 12-614-30-47, e-mail: dorotasobczyk@yahoo.com
Praca wpłynęła: 08.08.2014.
Przyjęta do druku: 10.10.2014.
Publikacja *online*: 10.10.2014.
Nie zgłoszono sprzeczności interesów.
Pol Arch Med Wewn. 2014; 124 (12): 688-694