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Members of the emergency medical team may have difficulty diagnosing rapid atrial fibrillation in Wolff-Parkinson-White syndrome

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Abstract

Background: *Atrial fibrillation (AF) in patients with Wolff-Parkinson-White (WPW) syndrome is potentially life-threatening as it may deteriorate into ventricular fibrillation. The aim of this study was to assess whether the emergency medical team members are able to diagnose AF with a rapid ventricular response due to the presence of atrioventricular bypass tract in WPW syndrome.*

Methods: *The study group consisted of 316 participants attending a national congress of emergency medicine. A total of 196 questionnaires regarding recognition and management of cardiac arrhythmias were distributed. The assessed part presented a clinical scenario with a young hemodynamically stable man who had a 12-lead electrocardiogram performed in the past with signs of pre-excitation, and who presented to the emergency team with an irregular broad QRS-complex tachycardia.*

Results: *A total of 71 questionnaires were filled in. Only one responder recognized AF due to WPW syndrome, while 5 other responders recognized WPW syndrome and paroxysmal supraventricular tachycardia or broad QRS-complex tachycardia. About 20% of participants did not select any diagnosis, pointing out a method of treatment only. The most common diagnosis found in the survey was ventricular tachycardia/broad QRS-complex tachycardia marked by approximately a half of the participants. Nearly 18% of participants recognized WPW syndrome, whereas AF was recognized by less than 10% of participants.*

Conclusions: *Members of emergency medical teams have limited skills for recognizing WPW syndrome with rapid AF, and ventricular tachycardia is the most frequent incorrect diagnosis.* (Cardiol J 2015; 22, 3: 247–252)

Key words: pre-excitation syndrome, Wolff-Parkinson-White (WPW) syndrome, atrial fibrillation, Emergency Department

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Introduction

Pre-excitation occurs when a part of the ventricle muscle is activated by an atrial activation wave earlier than expected by the normal atrioventricular (AV) conduction pathway through the AV node [1]. The most frequently encountered type of pre-excitation is an AV bypass tract with a fast conduction making its presence obvious by a short PR interval, widened QRS with a slurred upstroke, known as a delta wave. Formally, the Wolff-Parkinson-White (WPW) syndrome is recognized by electrocardiogram (ECG) signs of pre-excitation, symptoms of tachycardia including paroxysmal supraventricular tachycardia and an atrial fibrillation (AF) with a rapid ventricular response [1].

Pre-excitation is an important differential diagnosis when a patient is assessed in the Emergency Department for syncope or suspected cardiac arrhythmia [2, 3]. Identifying AF with a rapid ventricular response in the presence of AV bypass tract is the first step towards applying an effective treatment. Several other arrhythmias can mimic the WPW-related ECG features, in particular a polymorphic ventricular tachycardia (VT) and fast AF with an aberrant conduction due to a bundle branch block [4–6]. The assumption that emergency physicians should be familiar with the common electrocardiographic manifestations of pre-excitation is widely accepted but their real skills in this area are not well studied. Almost 30 years ago, it was found that the rapid wide QRS-complex tachycardias were poorly diagnosed [7] but the current ability to recognize rare cardiac arrhythmias remains unknown.

The aim of this study was to assess whether the members of emergency medical team are able to correctly interpret AF with rapid ventricular response due to the presence of AV bypass tract.

Methods

The study group consisted of 316 participants attending a congress of emergency medicine (15–17 November 2013, Lodz, Poland), and included emergency medicine students, rescuers (paramedics), nurses and medical doctors. A total of 196 questionnaires were distributed among delegates before the start of scientific sessions. Participants were asked to anonymously complete and return questionnaires within 15 min. Lecturers were not invited to participate in the study. The questions and ECGs were presented on paper and on the screen. The questionnaire consisted of several parts. First part consisted of questions regarding demographic data, profession, workplace and number of years in practice. The other part depicted a clinical scenario with a young hemodynamically stable man who had a 12-lead ECG performed in the past with signs of pre-excitation (Fig. 1), and who presented to the emergency medical service with an irregular broad-QRS tachycardia (Fig. 2). Participants were asked to mark a diagnosis and answer questions regarding the management of the patient. The ECG records were attached to each questionnaire, and participants were encouraged to keep them after the survey. For each participant it was noted whether he or she kept the ECG records as a reference or not.

The diagnosis of AF due to pre-excitation syndrome was considered the correct one. Amiodarone alone, or amiodarone and direct current cardioversion were considered the adequate treatment, with no other options allowed as the correct ones.

The Bioethical Commission of Wroclaw Medical University approved the study protocol.

Statistical analysis

The variables were presented as means and their standard deviations or numbers and/or percentages, and were compared using Student's t-test or Pearson's χ^2 test with Yates correction when appropriate. A logistic regression analysis was used to find association between the correct treatment and studied parameters: workplace, profession, years in practice, and the correct diagnosis. In the secondary analysis, the list of independent variables was completed by the results of observation whether the participants kept or not the attached ECG records for themselves. P-value less than 0.05 was regarded as significant.

Results

Study participants

Out of 196 congress delegates who were invited to participate in the study, 71 filled in the questionnaire. The highest proportion of responders was found in the group of rescuers (paramedics), while it was the lowest among the emergency physicians ($p < 0.001$). The results are presented in Table 1.

Among 71 participants who filled in questionnaire there were 31 women and 40 men, and their mean age was 33.5 ± 9.3 years.

Among medical doctors, there were 13 emergency medicine specialists, 2 emergency medicine trainees, 10 other specialists, and 2 postgraduate physicians.

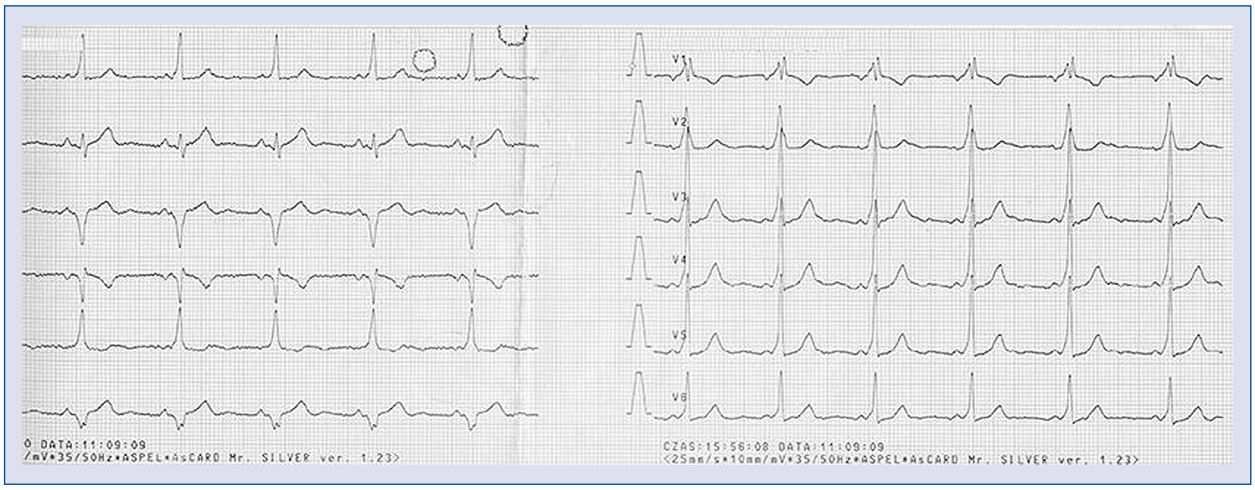

Figure 1. Electrocardiogram with signs of pre-excitation (delta wave).

Figure 2. Electrocardiogram presenting atrial fibrillation with a rapid ventricular response due to the presence of atrioventricular bypass tract.

Table 1. The study group characteristics with regards to involvement in the study.

	Total	Doctor	Nurse	Paramedic	Student
Number of registered participants	316	188	27	71	30
Number of filled in questionnaires	71	27	7	30	7
Filled in questionnaires as a proportion of registered participants	22.5%	14.4%	25.9%	42.3%	23.3%
Length of professional practice [years]	9.0 ± 9.0	10.8 ± 9.9	17.6 ± 12.8	4.9 ± 2.9	Not applicable

Diagnosis

Only 1 medical doctor recognized AF due to WPW syndrome, while 5 other responders recognized WPW syndrome and a supraventricular tachycardia or broad QRS-complex tachycardia. One participant changed his initially correct diagnosis of AF due to WPW syndrome, and eventually marked the VT as the correct answer. About 20% of participants did not mark any diagnosis, choosing a method of treatment only.

The most common diagnosis found in the survey was VT/broad QRS-complex tachycardia

Table 2. The proposed management of patient and how the participants answered that question.

	Total (n = 71)	Doctor (n = 27)	Nurse (n = 7)	Paramedic (n = 30)	Student (n = 7)
A patient may be left at home	0/63*	0/26	0/4	0/26	0/4
'Take and transport' option	12/56	7/23	1/4	2/23	2/6
Adenosine	16/58	7/23	1/3	6/26	2/6
Amiodarone	54/61	22/25	5/5	24/27	3/4
Verapamil	15/56	7/24	0/3	7/26	1/3
Digoxin	8/55	3/24	0/2	4/25	¼
Metoprolol	35/57	17/26	1/2	15/26	2/3
Lidocaine	27/53	12/23	1/2	12/24	2/4
Atropine	4/55	1/24	0/3	2/25	1/3
Epinephrine	4/56	1/24	0/4	2/25	1/3
Electroversion	36/63	18/26	3/5	11/25	4/7
Defibrillation	3/62	0/25	0/5	2/25	1/6
Transcutaneous pacing	4/58	1/25	0/5	2/22	1/6
Cardiopulmonary resuscitation	3/62	2/26	0/4	1/25	0/7
A patient is at risk of conversion to ventricular fibrillation	57/62	24/27	5/5	22/24	6/6
Electrocardiography monitoring is mandatory	66/66	27/27	5/5	27/27	7/7

*The numbers indicate how many responders selected the specific answer out of the total number of registered responses, and may differ from the total number of distributed questionnaires (n = 71).

marked by nearly a half of the participants. Nearly 18% of participants recognized WPW syndrome, whereas AF was recognized by less than 10% of participants. The survey results are presented in Figure 1.

ECG records were taken home by 18 (25.3%) participants: 10 (37%) medical doctors, 2 (28.3%) nurses, 5 (16.7%) paramedics, and 1 (14.2%) student.

Patient management

No responder would leave the patient at home for a further evaluation and treatment by general practitioner. The option 'take and transport' was considered correct by 12 (17%) responders. Amiodarone, metoprolol and the direct current cardioversion were the most commonly selected treatment options.

The correct treatment option was defined as amiodarone and/or a direct current cardioversion. Ten participants selected the right answer (4, amiodarone alone; 6, amiodarone with cardioversion). In the logistic regression analysis, those participants who kept the ECG records after the survey were more likely to give a correct answer in regard to treatment of the patient (OR 4.8, 95% CI 1.2–18.7, p = 0.025). No other covariate differed between those who selected the appropriate treatment option and those who did not. Treatment options are presented in Table 2.

Discussion

This study demonstrated that only very few of the delegates, including physicians, at a relatively large emergency medicine congress in Poland were able to correctly diagnose AF in patient with an accessory pathway and/or selected an appropriate treatment. A substantial number of participants did not fill in the questionnaire. Among those who did, many did not respond to all of the questions. These observations suggest that the ECG records were difficult to interpret for the congress participants.

Atrial flutter or AF may occur in patients with an accessory pathway, which is potentially life-threatening, due to the tendency to convert into ventricular fibrillation [8–13]. AF occurs in 1.6–18% of patients with WPW [8, 14–19]. Considering that the prevalence of WPW syndrome in the general population is 0.1–0.3%, it can be assumed that AF with the underlying pre-excitation syndrome occurs in 1.6 to 54 of 100,000 inhabitants per year.

The ability to recognize the signs of pre-excitation and AF in WPW is crucial for the adequate diagnosis and treatment, as well as for the long-term management [8]. It has been previously shown that emergency medicine students and specialists may have difficulty with recognizing rare ECGs in the emergency environment [20, 21].

In this regard, much less is known about paramedics. Furthermore, the inter-observer agreement in ECG diagnosis among emergency physicians has been shown to be low [22]. Participants of this survey distinctly tended to diagnose "ventricular tachycardia" as the culprit arrhythmia. Similarly, case reports presented in the literature indicate that AF due to WPW is underdiagnosed, and the most common incorrect diagnosis is VT [23, 24].

A direct current cardioversion is recommended for patients with AF and pre-excitation syndrome if a very high ventricular rate or hemodynamic instability is present [8]. Patient demonstrated in this study was a hemodynamically stable young man with a relatively low ventricular rate during AF. According to current guidelines, the patient could be initially treated pharmacologically but only a minority of participants selected the correct pharmacological treatment. The most obvious reason was an incorrect diagnosis of VT. Although amiodarone is recommended for both WPW and stable VT, lidocaine, selected as an alternative treatment option by many participants, it has no value in WPW syndrome. Other commonly used drugs marked by participants were verapamil and beta-blockers, which are indeed contraindicated and may be deleterious in such setting [25–27]. Both calcium antagonists and beta-blockers slow an AV nodal conduction without prolonging the refractory period of accessory bypass tracts, which may result in an acceleration of conduction through the bypass tract.

The correct treatment (amiodarone alone, or amiodarone and direct current cardioversion) was proposed by 15% of the participants only. Surprisingly, the only factor related to the choice of correct treatment was 'keeping included ECG records for own reference'. Therefore, those responders who took the ECGs home after the survey tended to select the right answer, which might indicate their special interest in the subject. Most of the responders appropriately assumed that the patient's rhythm might convert into a ventricular fibrillation, except for two participants. In this context, it is important to emphasize that the young age of patient with WPW syndrome is a risk factor for potentially malignant form of cardiac arrhythmia.

The literature regarding skills for recognizing WPW syndrome alone, and WPW syndrome with rapid AF in particular among members of Emergency Department medical team is scarce. Studies performed in students indicate a generally reduced ability to recognize cardiac arrhythmias. Lever et al. [28] reported that only 11% of final-year medical students and resident medical officers accurately recognized the WPW-syndrome pattern. The results are consistent with a growing literature suggesting that non-cardiologists often have difficulties in interpreting ECG tracings [29]. The present study indicates that Emergency Department staff needs a special training in rare but potentially lethal arrhythmias as the misinterpretation of tachycardia etiology may result in adverse outcome [25–27]. Nonetheless, it should be kept in mind that individuals who participated in the survey had no direct contact with the patient and, consequently, they might have responded differently when confronted with the patient in the real clinical scenario.

Limitations of the study

The most important limitation of the study was the structure of questionnaire. Limited options may have permitted a number of correct guesses.

Conclusions

1. Members of emergency medical teams have limited skills in recognizing WPW syndrome with rapid AF.
2. Ventricular tachycardia is the most frequent incorrect diagnosis.
3. The development of strategies aimed at increasing the ability to recognize this potentially life-threatening condition is urgently needed.

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Conflict of interest: None declared

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