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Inappropriate sinus tachycardia – cardiac syndrome or anxiety related disorder? Nieadekwatna tachykardia zatokowa – choroba serca czy zaburzenie związane z lękiem?

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Abstract

Introduction: Inappropriate sinus tachycardia is generally defined as an elevated resting heart rate (>90–100 bpm) with an exaggerated response to physical or emotional stress and a clearly sinus mechanism which is not secondary to a diagnosed somatic disease. Anxiety, a significant risk factor for cardiovascular disease, is recently recognized as a crucial issue in younger and older adults, with a causal relation to other risk factors, such as depression, substance use, overweight, sleep difficulties, or a sedentary life style. **The aim of the study** was to evaluate a possible relation between the level of anxiety, control of emotions in patients with manifestation of inappropriate sinus tachycardia and diagnosis of this syndrome. **Material and methods:** The study included 33 female patients with inappropriate sinus tachycardia (age range 31.8 ± 8.72) and 33 women (28.7 ± 4.4) without any cardiac diseases. The diagnosis of inappropriate sinus tachycardia was given by a cardiologist during hospitalisation of the patients in the 2nd Department of Cardiology and Department of Electrocardiology, Medical University of Lodz, Lodz, Poland. For psychological assessment the State-Trait Anxiety Inventory and Courtauld Emotional Control Scale both self-report, paper and pencil inventories were used. **Results:** A statistically significant difference was found between the group of women with inappropriate sinus tachycardia and the group of healthy women regarding the Anxiety-Trait. The results of the study have shown no other statistically significant differences between tested groups. **Conclusions:** Inappropriate sinus tachycardia is related to increased anxiety. More clinical trials are needed to confirm its psychogenic basis.

Key words: inappropriate sinus tachycardia, anxiety, emotion control

Streszczenie

Wprowadzenie: Nieadekwatna tachykardia zatokowa charakteryzuje się przyspieszonym zatokowym rytmem serca (>90–100 uderzeń na minutę) w trakcie czuwania z nasileniem dolegliwości podczas niewielkiego wysiłku fizycznego lub psychologicznego stresu. Zespół występuje przede wszystkim u młodych kobiet. Lęk stanowi istotny czynnik ryzyka chorób sercowo-naczyniowych, od niedawna w grupie młodszych i starszych pacjentów uznawany jest jego kluczowy wpływ na rozwój i przebieg chorób serca, obok takich czynników ryzyka, jak: depresja, używanie substancji psychoaktywnych, nadwaga, problemy ze snem czy siedzący tryb życia. **Celem pracy** była ocena ewentualnego związku pomiędzy poziomem lęku, kontrolą emocji u pacjentów z nieadekwatną tachykardią zatokową a diagnozą tego zespołu. **Materiał i metody:** Badaniami objęto grupę 33 pacjentek z nieadekwatną tachykardią zatokową (wiek $31,8 \pm 8,72$ roku) i grupę porównawczą 33 kobiet (wiek $28,7 \pm 4,4$ roku) bez stwierdzonych schorzeń kardiologicznych. Rozpoznanie nieadekwatnej tachykardii zatokowej w grupie badanej było ustalone przez zespół kardiologów opiekujących się chorymi w II Katedrze Kardiologii oraz Klinice Elektrokardiologii Uniwersytetu Medycznego w Łodzi. Do oceny psychologicznej wykorzystano standaryzowane, oparte na metodzie samoopisu, narzędzia diagnostyczne typu papier-olówek: Inwentarz Stanu i Cechy Lęku oraz Skalę Kontroli Emocji. **Wyniki:** Stwierdzono statystycznie istotną różnicę pomiędzy grupą kobiet z nieadekwatną tachykardią zatokową a grupą porównawczą w zakresie zmiennej lęk jako cecha. Dalsza analiza nie wykazała innych istotnych statystycznie różnic między badanymi grupami. **Wnioski:** Nieadekwatna tachykardia zatokowa jest związana z wyższym poziomem lęku. Konieczne są dalsze badania kliniczne w celu potwierdzenia psychogenego pochodzenia tego wciąż mało poznanego zaburzenia.

Słowa kluczowe: nieadekwatna tachykardia zatokowa, lęk, kontrola emocji

INTRODUCTION

Relations between psychiatry, psychology and cardiology are multidimensional and begin to have a growing importance in the diagnosis and treatment of cardiovascular surgery, cardiac electrophysiology and cardiac rehabilitation patients (Sobczak *et al.*, 2011). Palpitations in the course of tachycardia with narrow QRS are often a significant clinical problem. Improperly planned diagnosis can significantly extend the time for proper diagnosis and treatment implemented (Olshansky and Sullivan, 2012). Inappropriate sinus tachycardia (IST) is defined as a sinus tachycardia at rest [heart rate (HR) >100 bpm] in a sitting position or/and as an average HR >90 bpm during 24-hour Holter monitoring. The most common symptoms are palpitation, dizziness, chest discomfort, orthostatic intolerance, and fatigue. Sometimes, the symptoms can be severe and debilitating, and its aetiology is not fully understood. The symptoms of a 24-hours ECG record of patient with IST with a trend to sinus tachycardia during a day are shown in Fig. 1.

Patients, predominantly women, suffering from IST, experience a severe somatic disease significantly lowering the quality of their life, sometimes for many years. Interestingly, clinical manifestations range from patients who are totally asymptomatic to those suffering incapacitating incessant tachycardia. Common complaints include palpitations, lightheadedness, presyncope, syncope, orthostatic intolerance, chest pain/pressure, dyspnoea, and exercise intolerance. Noncardiac symptoms, such as anxiety, depression, abdominal discomfort, myalgia, and headache are frequent as well. In many patients, the history will have functional overtones, with symptoms disproportionate to the severity of the tachycardia, and difficult to temporarily relate to periods of more elevated HR. Efforts to treat the tachycardia alone often do not ameliorate symptoms (Pellegrini and Scheinman, 2016). The symptoms encountered most often in the reported cases of IST are listed in Tab. 1 (Peyrol and Lévy, 2016).

The number of diagnosed patients who suffer from IST is still low. The reason for this can be seen in its low prevalence but probably also in suboptimal diagnostic work-up. Early diagnosis can reduce further unnecessary tests and reclaim the patient's full physical fitness and sense of well-being (Still *et al.*, 2005). Nowadays, in the diagnostic process of cardiovascular diseases particular attention is paid to the physiological, genetic or social background of the disease. Psychosocial aspects are reported to play an important role in this process (Kones, 2011).

Palpitations	Dizziness	Lightheadedness
Presyncope	Chest pain	Shortness of breath on exertion
Exercise intolerance	Myalgia	Headaches
Anxiety	Depressed mood	Abdominal discomfort
Fatigue	Blurred vision	Sweating

Tab. 1. Symptoms reported in patients with IST

Potential psychological risk factors for cardiovascular diseases (CVD) can be grouped in three domains. The first consists of negative affective states including depression, anxiety, distress, and anger, the second includes personality patterns such as Type A behaviour pattern and Type D personality, and the third comprehends social factors including socioeconomic status and social support (Smith and Blumenthal, 2011). Anxiety, a significant risk factor for CVD, is recently recognised as a crucial issue in younger and older adults, with a causal relation to other risk factors, such as depression, substance use, overweight, sleep difficulties, or a sedentary life style (Allgulander, 2016; El-Gabalawy *et al.*, 2014). Potijk *et al.* (2016) found that in the presence of a parental history of heart disease, poor emotion control in young adults (18–20 years) was a predictive factor for long-term risk, even controlling for lifestyle and biomedical risk factors. The implications of poor emotion regulation strategies, higher levels of anxiety or depression, and psychophysiological dysregulation seem to be the most relevant in prevention and treatment, with significant impact in morbidity and mortality in anxious as well as in CVD patients (Ouakinin, 2016). Still little is known about the substrate for IST. There is some evidence indicating that one of the causes of this cardiac syndrome are psychological factors. Marrouche *et al.* (2002) reported that 100% of patients with IST had some psychiatric diagnosis (schizophrenia, depression, panic disorder, or somatoform disorder). A significant improvement can be achieved even after a simple explanation of the character of illness symptoms and prognosis, as these are still mysterious syndrome symptoms. The aim of the study was to investigate the relationship between the level of anxiety, control of emotions in patients and manifestation of IST.

MATERIAL AND METHODS

The study involved a convenience sample of 33 female patients with IST (age range 31.8 ± 8.72) and 33 women (28.7 ± 4.4) without any cardiac diseases. The diagnosis of

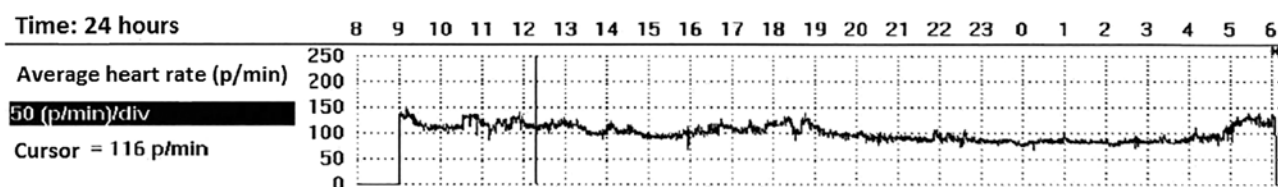


Fig. 1. Example of a 24-hour ECG record in a patient with IST with a trend for sinus tachycardia during the day

IST was established by a cardiologist following the assessment of the patients at the Department of Cardiology and Department of Electrophysiology of the Medical University of Lodz, Lodz, Poland. All subjects included in the study were informed about the aims and methods of the study, and expressed their written informed consent for participation in this study. The study protocol was approved by the local Bioethics Committee.

For psychological assessment two standard evaluation scales were used: Spielberger's State-Trait Anxiety Inventory (STAI) which is a self-report instrument consisting of two 20-item scales addressing state and trait anxiety. Respondents are asked to rate each of the 20 items on a 4-point Likert-type rating scale from 1 – "not at all" to 4 – "very much," with a sum score between 20 and 80. The 20 items are divided into two groups: ten items are formed to record the presence of anxiety symptoms and the other ten items are scored to record the absence of anxiety symptoms. The latter are inverted for the purpose of calculating the sum score (Spielberger *et al.*, 1983). Another tool was the Courtauld Emotional Control Scale (CECS) (Juczyński, 2001). CECS comprises three subscales: anger, depressed mood, and anxiety. It is used to measure the extent to which individuals control their anger, depression, and anxiety in difficult situations. The statistical analysis for this study was performed using Statistica 12.5 package (Statsoft Inc., USA). In order to estimate the average values for the quantitative characteristics, arithmetic means (*M*) were estimated. Standard deviation (*SD*) was adopted as the measure of scatter. Normality of distribution was tested with Shapiro–Wilk test. The statistical analysis of the studied variables was carried out with Mann–Whitney *U* test. In all the statistical methods, *p* value lower than 0.05 was considered significant.

RESULTS

Mean age in the group with IST was 32.0 ± 8.5 and 28.7 ± 4.4 in healthy volunteers. A statistically significant difference between the group of women with IST and the group of healthy women in Anxiety-Trait ($p = 0.008$) has been noticed. Statistically significant differences in STAI between women with IST and healthy women are shown in Tab. 2. The result of analysis shows no other statistically significant differences between the tested groups. Statistical differences in CECS between women with IST and healthy women are shown in Tab. 3.

DISCUSSION

It is known that psychological and social factors have a significant impact on the majority of cardiac diseases. It seems that IST patients apart from heart problems suffer from anxiety disorder, as well. It should affect not only the pharmacological treatment but also psychotherapy, and encourage patients to take up regular physical activity (Femenía *et al.*, 2012). Another important problem is

STAI test	Z	p
State	-1.46	0.145
Trait	-2.64	0.008

Tab. 2. Statistically significant differences in STAI between women with IST and healthy women

the need for early diagnosis and treatment of coexisting psychiatric disorders of cardiacs – due to the frequency of their occurrence and their impact on the quality of patients' life. The detection of dysfunction by a cardiologist, psychologist and psychiatric consultations can effectively prevent the accumulation of somatic and mental setback risk.

The treatment of IST is complicated despite good prognosis. The severity of symptoms is sometimes very high, causing a significant reduction in overall efficiency of patients, difficulties in concentration, and even depressive states. β -blockers and calcium channel blockers are still first-line medication (Femenía *et al.*, 2012; Olshansky and Sullivan, 2012; Still *et al.*, 2005). Unfortunately, most patients do not tolerate high doses, complaining about symptoms of hypotension. Some authors perceive ivabradine as a new form of treatment, a selective blocker of *If* channels in the sinus node. The neutral effect of ivabradine on haemodynamic features makes this drug a very promising therapeutic alternative. Combining this drug with small dosages of β -blocker is safe and well tolerated (De Pauw *et al.*, 2013; Nwazue *et al.*, 2014; Ptaszynski *et al.*, 2013). Also small dosages of benzodiazepines, in addition, may provide relief, as it is likely that many IST patients have a superimposed anxiety disorder. Fludrocortisone, volume expansion, compression stockings, phenobarbital, clonidine, psychiatric evaluation, erythropoietin, recommended by some, have not been proven valuable (Brady *et al.*, 2005). It should be mentioned that in IST cases that are refractory it is possible to consider modifying the sinus node with a current of radiofrequency energy or cryoablation. However, the high risk of permanent damage to the physiological pacemaker and the low effectiveness limit the usefulness of these methods (Shen, 2002). A meta-analysis performed by Roest *et al.* (2010) showed that anxiety seems to be an independent risk factor for coronary heart disease (CHD). Likewise, Lavie *et al.* (2011) documented that anxiety is an independent factor causing CHD and increased mortality. Acute and chronic anxiety also appears to be a risk factor for other cardiovascular diseases (Lavie *et al.*, 2011). In our research a statistically significant difference regarding anxiety as

CECS test	Z	p
Control of Anger	0.43	0.665
Control of Depression	-1.03	0.302
Control of Anxiety	0.68	0.495
Total	0.02	0.980

Tab. 3. Statistical differences in CECS between women with IST and healthy women

a trait between the study and the control group was found. Female patients suffering from IST were far more likely to perceive harmless situations as dangerous than women without inadequate sinus tachycardia. Similarly, Mayou *et al.* (2003) showed relation between the human psyche and heart disorders. Results of their study suggest that patients with palpitations experience emotional states like anxiety and depression. The results of our research show that in the study group women more often had high scores in anxiety in comparison to control group. Hence, there can be an impact of anxiety on the development of IST. Results obtained by American scientists clearly indicate that anxiety is one of the main factors that independently cause CHD, confirming the validity of the aforementioned thesis (Lavie *et al.*, 2011). Furthermore, García-Vera *et al.* (2010) showed that the level of anxiety-trait is higher in people with hypertension than in people with normal blood pressure. Also, the degrees of suppression of negative emotions seem to be important as a factor which can promote the development of IST. Our study demonstrate that people with inappropriate sinus tachycardia more often achieve higher scores in suppression of negative emotions compared to a group of healthy subjects. This may suggest that internalised negative emotions may lead to exacerbations of IST. Additionally, Jokela *et al.* (2014) reported that coronary disease can be a result of experiencing negative emotions through dysregulation in the functioning of the autonomic nervous system. Other authors have observed that suppression of negative emotions can adversely affect blood pressure control in patients with hypertension. This may suggest that suppression of negative emotions should be considered as the cause of uncontrolled hypertension (Symonides *et al.*, 2014). Several limitations of the study must be emphasised. The sample of the study was limited to 33 female patients, but it is important to notice that IST is very rarely diagnosed in population. The observation period of the study was short, and further longitudinal studies with repetitive measurement are needed to provide more detailed and precise descriptions of both the pattern and the dynamics of emotions control and the level of anxiety in the course of IST. It should be emphasized that IST is a mild arrhythmia, and there is no evidence of an effect of chronic sinus tachycardia on cardiac function impairment. Frequently, a significant improvement can be achieved by explaining to the patient the nature of their symptoms and the prognosis in this still mysterious cardiac syndrome. It is advisable not only to start medical treatment but also psychotherapy, and encourage patients to take up regular physical activity. Consider a multidisciplinary and integrated approach. Empower the patient to be engaged in the treatment plan. Encourage graded physical activity as tolerated, eliminate dietary stimulants (e.g., caffeine or alcohol) and stimulant drugs, minimize drug interventions, and start with modest doses of β -blockers. No specific β -blocker is superior or free of side effects. Also benzodiazepines and β -blocker combinations, with a careful follow-up, may be effective (Olshansky and Sullivan, 2016).

CONCLUSIONS

Inappropriate sinus tachycardia is related to increased anxiety. More clinical trials are needed to confirm its psychogenic basis. Psychological and psychiatric consultations are worth considering in this group of patients. More clinical trials are needed to confirm its psychogenic basis.

Conflict of interest

The authors do not report any financial or personal relationships with other persons or organizations that could adversely affect the content of the publication and lay claim to this publication.

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