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ANABOLICSTEROIDS THERAPY AS A TRIGGER OF CONDUCTION DISORDERS IN ATHLETES

Abstract. *The high prevalence of WPW syndrome among young people dictates the relevance of this topic studying. In the register of causes of sudden cardiac death among athletes, the proportion of this syndrome is about 1%. The frequency of SCD in professional sportsmen cluster of population, according to various authors, varies from 2.3 to 6.5 cases per 100 thousand active athletes that in 2.4 times higher than in the general population.On example of the clinical case demonstrated in this article the importanceof a precise examination of athletes and amateurs, withdetected WPW phenomenon/syndrome, regardless of presencesymptoms, especially on continuous anabolic steroids therapy background. Therefore, it is necessary to control not only the physical activity of people involved in sports, but also the use of pharmacological drugs in preparation for competitions.*

Keyword: *ssudden cardiac death, athlete, WPW syndrome, clinical case*

Introduction. In 1930 L. Wolf, I. Parkinson and P.D. White published an article with observation of 11patients who suffered from tachycardia attacks, and in the period between attacks had onECG sinus rhythm, short PQ interval and wide QRS complex thatresembled the left bundle branch block. In the name of these authors the syndrome wasnamed "Wolf-Parkinson-White" (WPW) [1].WPW syndrome is a congenital anomaly of the heart conduction system structurein the form of an accessory Kent bundle, which connects the atrial andventricularmyocardiumdirectly, bypassing the atrio-ventricular junction, with the ability to conduct a rapid pulse. Additional ways of impulse conduction are formed in the embryonic period in the form of muscular bridges thatpass through the fibrous ring between the atria and ventricles [2].WPW syndrome is one of the variantsof "premature excitation" of the ventricles – syndrome of premature ventricular preexcitation, with the ventricular myocardium activation through accessory abnormal conduction pathways by atrial pulse earlier, than it would be expected when the pulse impulse enters the ventriclesthrough the normal specialized conduction system of the heart. If ventricular preexcitationis notaccompanied by clinical symptoms, this disorder recognized as"ventricular preexcitationphenomenon" [3].

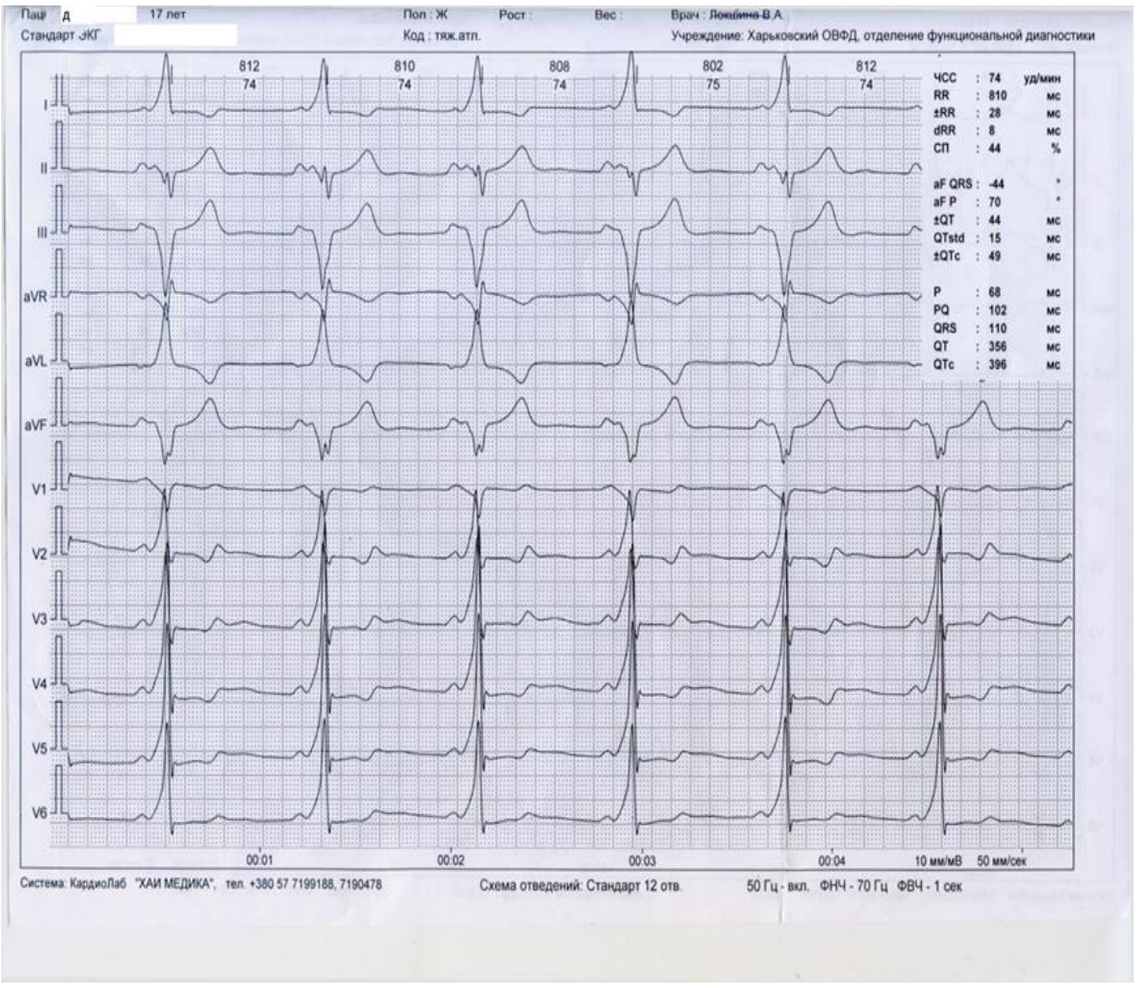
WPW syndrome is more common in men than in women (60% / 40% accordingly). Age of patients can be different. Most often, WPW is found in children oradolescence who are seeking emergency care due to tachyarrhythmias development or the preventive observations.The impulse conduction speed through accessorypathways decreases with age,apparently due to the development of fibrosis. There are reports when ECG signs of premature excitation of the ventricles completely disappearedover time, in prevalent number of cases after 40 years.Up to 80% of patients with WPW syndrome tolerate paroxysmal reciprocal (circular) tachycardia, 15-30% - have atrial fibrillation episodes, 5% - atrialflutter [2].The risk of sudden cardiac death (SCD) is about 0.15 - 0.39%.In 50% of sudden deaths in patients with known WPW, the cause of death wasthe first episode of tachyarrhythmia developed. WPW syndrome ranks first place among the causes of pathological tachycardia and arrhythmiasin the world in the children population.

Every year2 thousand cases of SCD were observed during physical training and professional sports [3].

The frequency of SCDin professional sportsmen cluster of population, according to various authors, varies from2.3 to 6.5 cases per 100 thousand active athletes that in2.4 times higher than in the general population.The official definition of the term "sudden cardiac death of athletes" include cases of deaths that occurred directly during exercise, as well aswithin the first 24 hours after the symptomsonset that forced the athlete to change or to cease physical activities.The high prevalence of WPW syndrome among young people dictatesthe relevance of this topicstudying. In the register of causes of sudden cardiac deathamong athletes, the proportion of this syndrome is about 1% [1]. Arrhythmogenic disease are 3 times more frequent among athletes andheart rhythm disturbances are one of the most frequent causes of contraindicationof sports activities. Cardiac arrhythmias appearance anddifficulties in their management in athletes population induced by the widespread use of “illicit drugs” or dopingused to be taken both by professional and non-professional young athletes [4]. The International Olympic Committee list of “Prohibited classes of substances” includes: a) stimulants, b) narcotics, c) anabolic agents (androgenic steroids and others such as beta-2 stimulants), d) peptide hormones, mimetics and analogues, e) diuretics, f) agents with antiestrogenic activity, g) masking agents[4]. The use of anabolic drugs has highly prevalentamong athletes, body builders andamateurswiththe aim to increasestrength and muscle mass. Anabolic androgenic steroids are synthetictestosterone derivatives withminimal androgenic activity [5].

Clinical case discussion. In our clinical case described in this article, 17 year old athlete, female was referred to her routine annual examination. Patient had no complains. During ECG examination were found WPW – phenomenon changes (picture 1)

Picture 1. Patient ECG during her initial annual ambulatory checkup.Sinus rhythm. Heart rate -74 per minute. electrical axis of the heartis shifted to the left. Onthe ascending knee of the R wave the Δ-wave visualizes in all leads(WPW phenomenon, type B).



According to the patient's anamnesis data, she used to take anabolic steroids around 2 years with the aim to increasestrength, muscle mass and athletic performance as she is professional weightlifter. She has started her professional career at 14. Previous annular routine observations didn't find any pathological changes. Not a smoker or drug addicted. Low pitched voice timbre. Hyperstenic body building. Active, orientated in time and environment. The skin is pink, clean, moderate humidity. Draws attention to the location of hair growth by the male type: on the temples, above the upper lip, on the mammary glands, along the midline of the abdomen, in the lumbar region. Visible mucous membranes are clean, pink. Subcutaneous fat is well developed. Edemas are absent. Lymph nodes and thyroid gland are not palpable. There is no pathological pulsation of the vessels of the neck area. Bones and jointsstructure without pathological changes. Muscular systemisoverdeveloped. Hypertrophy of the muscles of the neck and arms, especially the biceps, was observed, according to the masculine body type

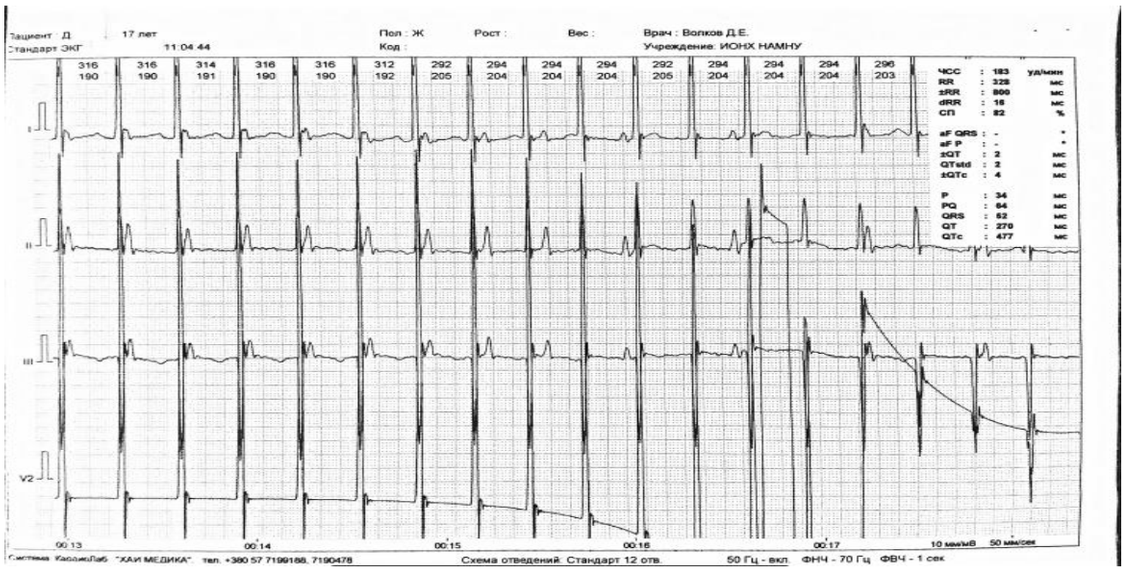
structure.Chest without pathological changes, take part in the respiratory act symmetrically. Palpation and percussion examination revealed no pathological changes. Auscultatory on the entire surface of the lungs is vesicular respiration, somewhat weakened due to well-developed subcutaneous fat and hypertrophied muscles of the upper shoulder girdle.Examination of the heart area revealed no pathological changes. During auscultation: heart tones are clear, rhythmic, systolic soft functional murmur revealed.Pulse is symmetrical on the upper extremities, rhythmic, frequency 74 beats per minute, with good filling and tension.Blood pressure is 120/80 mm Hg on both hands. No clinically important changes were found during observation of abdomen and kidneys area.

Preliminary diagnosis of WPW phenomenon was made and patient was referred to electrophysiological study and heart echo-cardiography as for such patients category the intent of risk stratification to identify those at risk for lethal arrhythmias and SCD plays an important role in further prognosis and management strategy choice.Noninvasive methods for risk stratification are used for determination of possible antegrade conduction and the risk of ventricular arrhythmias and include Holter monitoring, exercise treadmill testing, and echocardiography. In case if a low-risk pathway cannot be confirmed, or the presence of multiple accessory pathways is suspected, invasive testing should be undertaken. Electrophysiologic (EP) studies, including intracardiac catheterization and transesophageal studies, can characterizing the anterograde conduction of the accessory pathwayproperties [6].

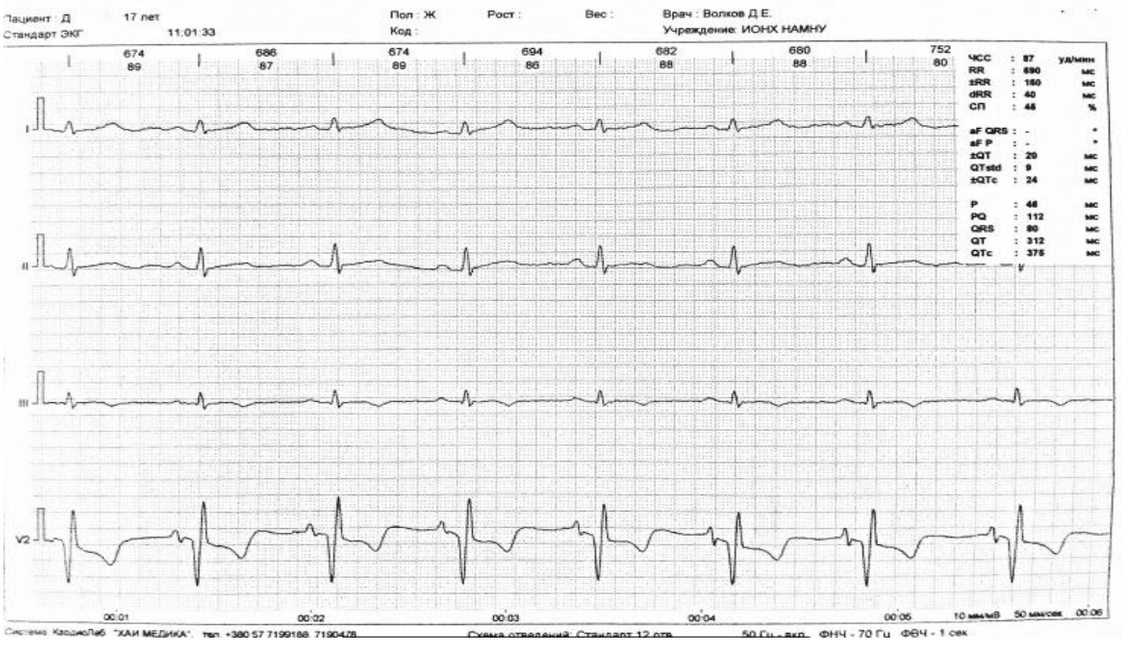
Heart echo cardiography showed: ejection fraction – 58%, mitral valve insufficiency 1st degree (6mm), intraventricular septum – 10 mm, left ventricular diastolic diameter – 51 mm, left ventricular systolic diameter – 36 mm, posterior wall thickness – 10mm, , left ventricular systolic volume – 53ml, left ventricular diastolic volume – 124ml. Right ventricle mass and structure is not changed. Both atriums are in the normal limits.

Esophageal electrophysiological examination showed: Intermittent WPW phenomenon without paroxysmal heart rhythm violations. Complete absence of premature ventricular preexcitation in atrial stimulation frequency – 130 beats per

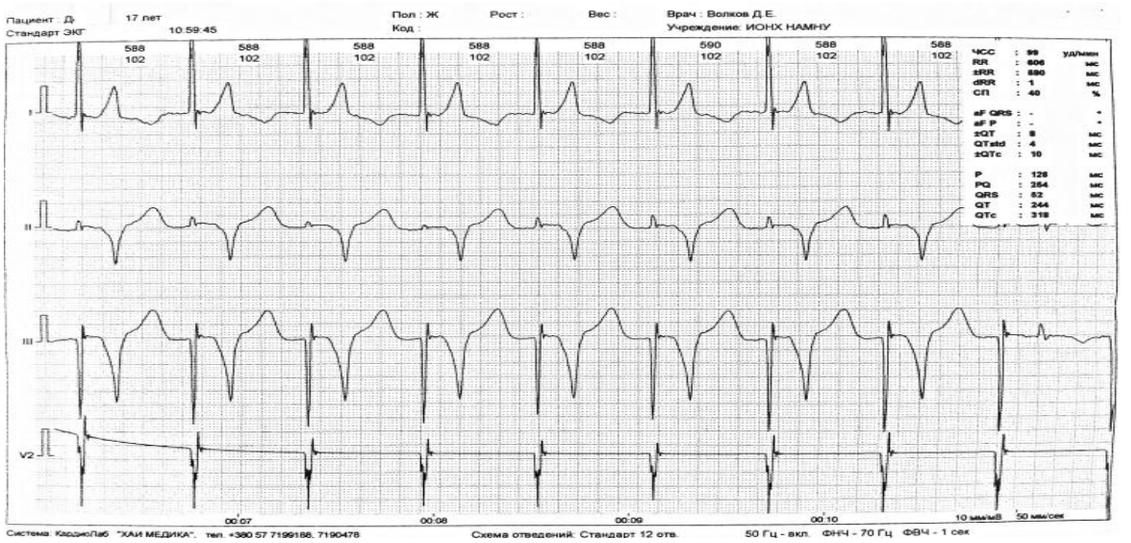
minute. Conduction block through Kent bundle in stimulation frequency rate – 130 in minute. Initial heart rate – 65 beats in min., after the first esophageal electrophysiological examination – 60 beats in min.Wenckebachpoint – 195 impulses. No tachyarrhythmias were stimulated during different electrophysiological stimulation regiments used (see picture 2 and 3).



Picture 2.**Series of esophageal electrophysiological examination ECG data, average heart rate – 183 beats per minute**

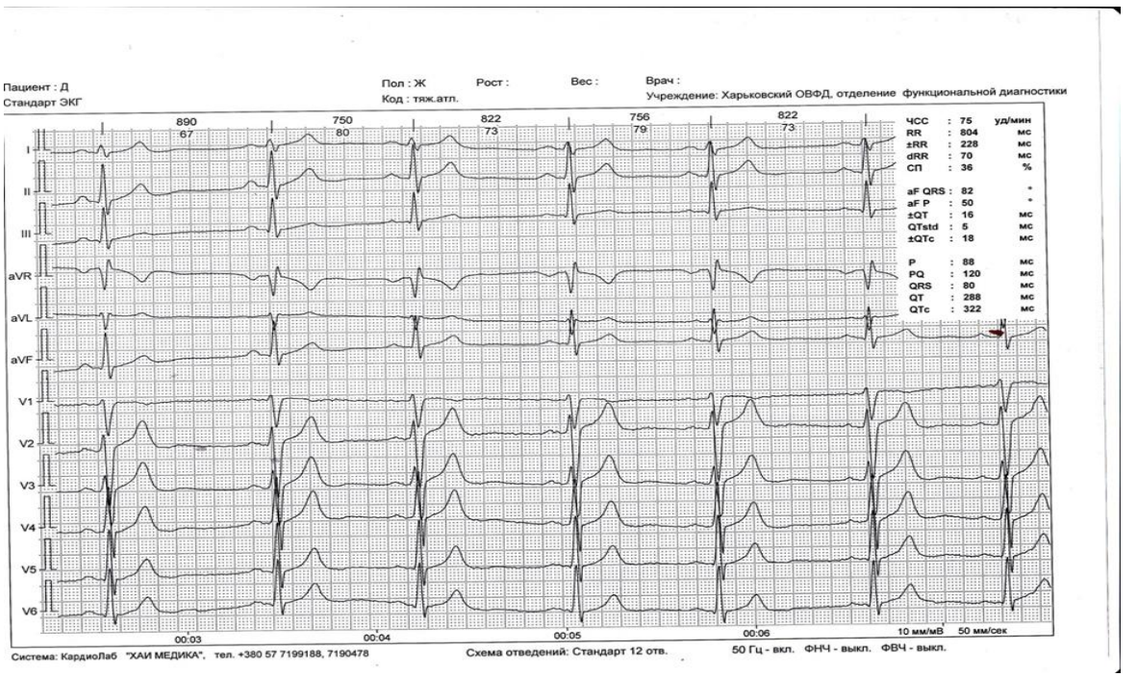


Picture 3. **Series of esophageal electrophysiological examination ECG data, average heart rate – 87 beats per minute**



Picture 4. **Series of esophageal electrophysiological examination ECG data, average heart rate – 99 beats per minute**

After observation performed it was recommended to cancel the use of anabolic steroids and further cardiologist supervision with ECG monitoring once in every 3 months.During the dynamic observation, it was found normalization of conduction activities, the signs of the WPW phenomenon are disappeared (picture 5).



Picture 5. **Patient ECG in 3 month after her initial annual ambulatory checkup and anabolic steroids therapycessation.Sinus arrhythmia. Heart rate -76 per minute. Vertical electrical axis of the heart**

The management of WPW syndrome/phenomenon differs depending on presence of symptoms in each patient's case. In the case of asymptomatic athletes with WPW pattern on ECG, risk assessment is necessary to determine their preparticipation clearance and is best performed through a referral to cardiology. A discussion of family risk assessment should also be considered, as the prevalence of WPW in family members is 5.5 per 1000 and has the potential for an autosomal-dominant inheritance pattern [6]. As during esophageal electrophysiological examinationno tachyarrhythmias were stimulated during different electrophysiological stimulation regiments used, the transcatheter ablation as the potential method for a definitive cure, was a matter of discussion and was postponed. After anabolic drugs therapy cessation heart conduction was restored without any invasive management. In case of intermittent preexcitation or loss of preexcitation, the management strategy recommended is cardiology follow up and symptoms awareness [6].

Conclusion. On example of the clinical case demonstrated in this article the importanceof a precise examination of athletes and amateurs, withdetected WPWphenomenon/syndrome, regardless of presencesymptoms. Thus, the use of anabolic steroids by athletes leads not only to the hormonal metabolism changes, which is manifested phenotypically, but also to deeper changes in the body at the cellular level, in particular the conduction system of the heart. Such changes may be life-threatening with the risk of sudden cardiac death of athletes.Therefore, it is necessary to control not only the physical activity of people involved in sports, but also the use of pharmacological drugs in preparation for competitions.

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