КЛІНІЧНІ ВИПАДКИ

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ATRIOVENTRICULAR TYPE I HEART BLOCK ASSOCIATED WITH PSEUDO-PACEMAKER SYNDROME: A CASE REPORT

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Abstract. Distinctive atrioventricular type I heart block is diagnosed when the PQ interval is 0.30 s. or more. Prolongation of the PQ interval more than 0.50 s. is a very rare condition. Usually it is associated with a pseudo-pacemaker syndrome. The last one manifests itself with dizziness, syncope, general weakness, shortness of breath upon physical exertion, cough, seizures, cold sweat, a feeling of pulsation in the head, neck and abdomen, a headache, paroxysmal nocturnal dyspnea, swelling of the lower extremities, tachypnea and jugular venous pulsation. The P wave appears immediately after the previous QRS complex. Atrial contraction occurs at the moment when the ventricles don't relax after the previous contraction; due to the fact that pressure in the ventricles at this moment is higher than in the atria, the tricuspid and mitral valves remains closed. During the atrial contraction, most of the blood is ejected not into the ventricles, but backward into the pulmonary veins from the left atrium and into the venae cavae from the right atrium. Also, an atrial kick is absent which results in a less ventricular filling. There is increased pressure in the atria leading to their distension and excessive secretion of the atrial natriuretic peptide.

A case report of the distinctive atrioventricular type I heart block associated with the pseudo-pacemaker syndrome is described. The patient suffered from a pre-syncope, short-term dizziness during the previous two days, tinnitus, general weakness, feeling of pulsation in the abdomen, neck, head, which interfered with his sleep. He developed these complaints after an infectious disease, which manifested as a runny nose and sore throat. In this patient, an extremely prolonged PQ interval up to 0.70 s. was observed. Also, episodes of Mobitz I and Mobitz type II atrioventricular block were detected. During the monitoring of patient state, the interval PQ was gradually shortening, and in 1 month it reached the normal duration.

It can be assumed that in the case of distinctive atrioventricular type I heart block, a significant prolongation of the refractory period in the rapid pathways of the AV-node plays a key role in the pathogenesis of this condition.

According to the recommendations of the ACC/AHA (1998), for patients with distinctive atrioventricular type I heart block accompanied by the pseudo-pacemaker syndrome and documented alleviation of symptoms with temporary AV pacing, the pacemaker implantation should be considered (IIaB). The implantation of dual chamber pacemaker may reduce symptoms and lead to an improvement in the functional state of patients, in whom shortening of the interval between atrial and ventricular contractions improves hemodynamics. For asymptomatic patients with the PQ interval of ≥ 0.30 s, pacemaker is not recommended. The distinctive atrioventricular type I heart block in patients with pseudo-pacemaker syndrome is a rare condition and often remains undiagnosed. But it may have a benign course with a gradual normalization of the PQ interval. Indications for permanent pacemaker implantation should be reviewed as this block may be completely reversible. A permanent pacemaker may be used in the case of absence of positive dynamics in a shortening of the PQ interval.

Keywords: distinctive atrioventricular type I heart block, pseudo-pacemaker syndrome, extremely prolonged PQ interval.

Introduction. Distinctive atrioventricular type I heart block is diagnosed, when a prolongation of the PR interval to 0.30 s. or more is detected on electrocardiogram (ECG) [1]. PR interval ≥ 0.50 s. is a very rare feature. An extremely prolonged PR interval causes diagnostic and management challenges in the clinical practice [2].

Often patients with the distinctive atrioventricular type I heart block have a pseudo-pacemaker syndrome. Chirife and co-authors have called the hemodynamic disturbance produced by the distinctive atrioventricular type I heart block as the "pacemaker syndrome without a pacemaker" [3]. In the case of VVI pacing mode the retrograde ventriculoatrial conduction occurs; atria contracts after the ventricular contraction. Such non-physiological interval between the atrial and ventricular contraction leads to the pacemaker syndrome [3]. In other words, there is loss of atrioventricular synchrony [4]. But this syndrome may occur not only in the patients with implanted pacemaker. Also, it occurs in the case of distinctive atrioventricular type I heart block, when P wave presents just after the previous QRS com-

plex because of the extremely prolonged PR interval. In this case it's named as the pseudo-pacemaker syndrome.

The patients with pseudo-pacemaker syndrome complain of dizziness, syncope, fatigue, breathlessness upon exertion, cough, bilateral leg swelling, seizures, cold sweat, feeling of pulsation in the abdomen, neck and head, headache, nocturnal dyspnea. On examination, jugular vein distension and jugular pulsation (Cannon atrial waves), dyspnea are revealed [5-7].

The pseudo-pacemaker syndrome is characterized by a fall in the systolic blood pressure, signs of heart failure, venous Cannon A waves [7]. The distinctive atrioventricular type I heart block may cause symptoms of heart failure even in the case of normal left ventricular systolic function. It occurs because of appearance of non-physiological interval between the atrial and ventricular contractions. There are a few mechanisms of development of these symptoms. At first, the atrial contraction against closed mitral and tricuspid valves during ventricular systole leads to loss of the atrial contribution to ventricular filling causing fall in the cardiac output with following reduction of the systolic blood pressure. So, ventricles don't receive the volume of blood that is maintained by the atria, also called the "atrial kick". Normally, the atrial contraction provides 20–30% of the cardiac output [8].

If the atria contract at the moment when mitral and tricuspid valves are closed, the blood is ejected into the pulmonary veins from the left atrium, and into the venae cavae from the right atrium. Right atrial contraction against a closed tricuspid valve causes pulsation in the neck, head and abdomen.

Increased pressure in both atria leads to congestion in the systemic and pulmonary circulation. Also, it contributes to an increased level of the natriuretic peptides in the plasma.

Case report. A 27-year-old Ukrainian man was admitted to an emergency department because of presyncope that had occurred suddenly during walking in the park. The patient complained of dizziness, tinnitus, feeling of the pulsation in the neck, head, abdomen that impedes the sleep. These complaints developed a week after an infectious disease, which manifested as a runny nose and sore throat. He is a smoker. The patient had a chickenpox 6 years ago. He works as a welder.

ECG was done on the day of admission, on the 3-rd, 5-th day, and in 1 month after hospitalization. Also, 24-hour Holter monitoring was performed on the 3-rd day of admission.

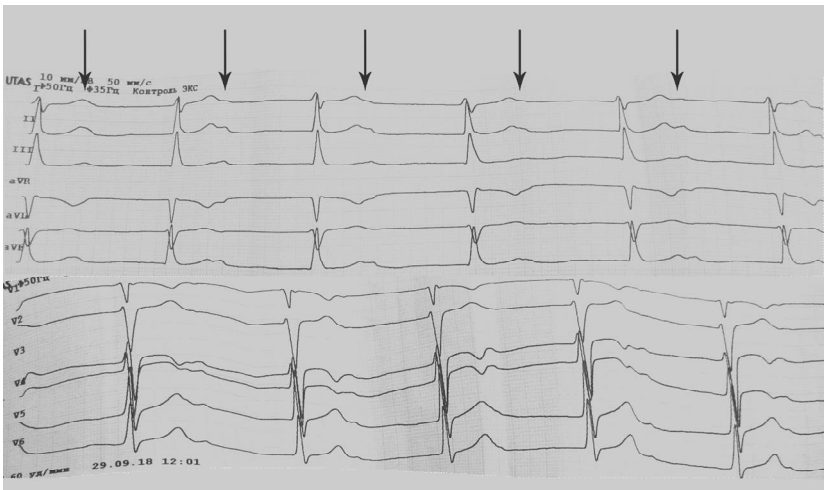

Fig.1. ECG on the day of admission. Distinctive atrioventricular type I heart block with extremely prolonged PR interval (660 ms). P waves are arrowed. P waves merge with T waves.

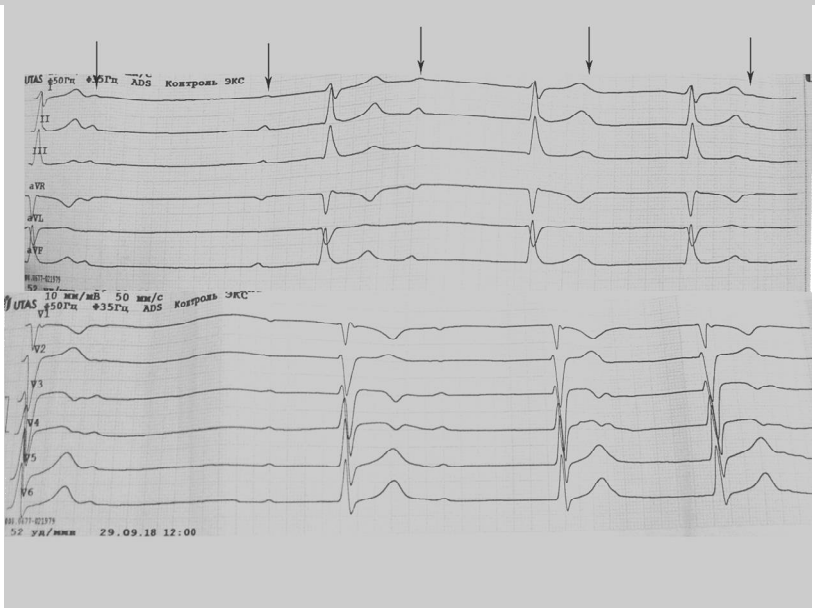

Fig. 2. ECG on the day of admission. Mobitz type II atrioventricular block, atypical Wenckebach with following distinctive atrioventricular type I heart block (maximal PR interval is 700 ms). P waves are arrowed. QRS complex is absent after the first P wave. The second P wave is conducted to the ventricles, PR interval is 440 ms. PR interval after the third P wave is 700 ms, and after the fourth one is 620 ms.

Fig. 3. ECG on the day of admission. Mobitz type II atrioventricular block (atypical Wenckebach) with extremely prolonged PR interval. P waves are arrowed.

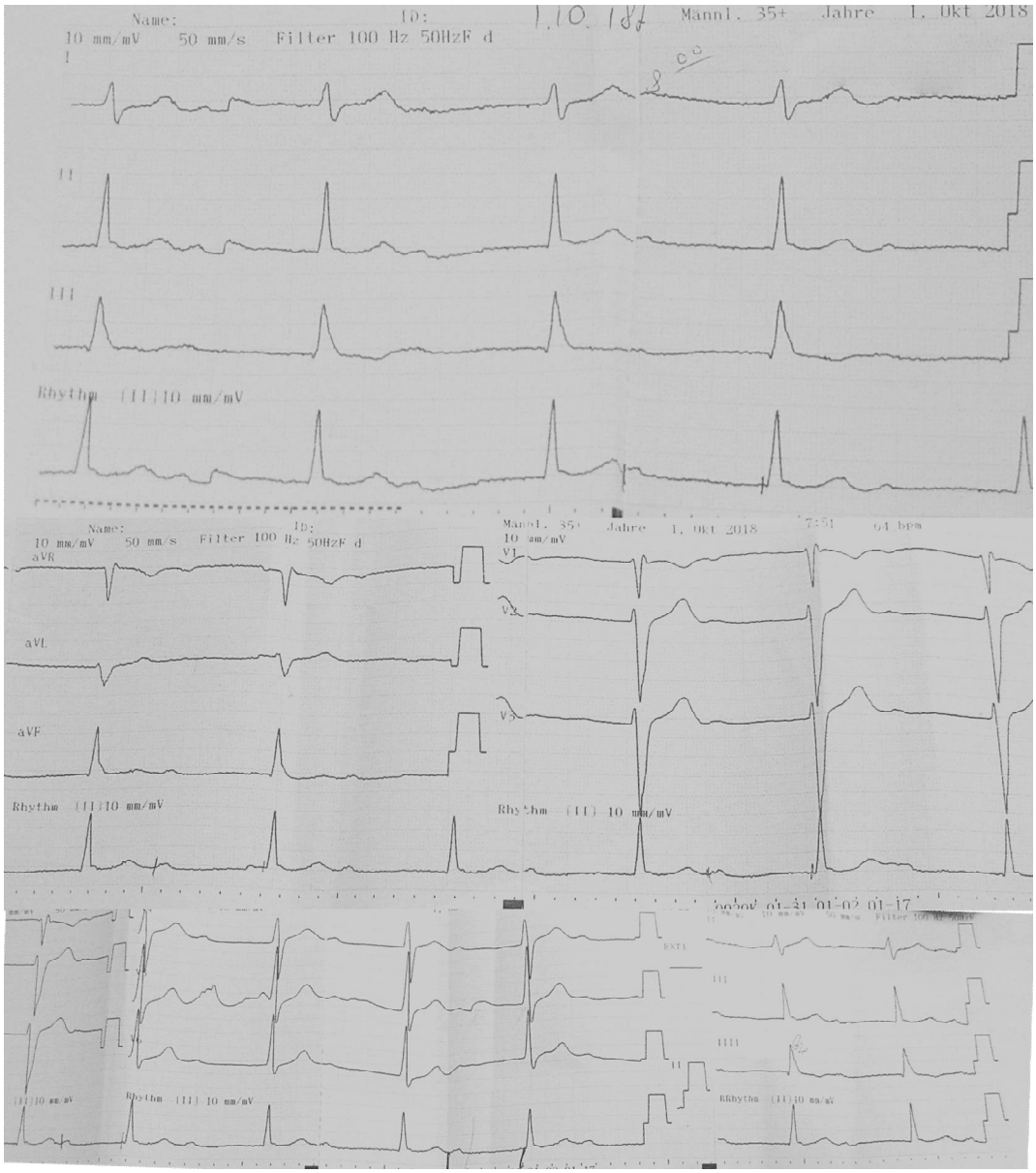

Fig. 4. ECG on the third day after admission. Distinctive atrioventricular type I heart block with extremely prolonged PR interval (it ranges from 500 ms to 560 ms).

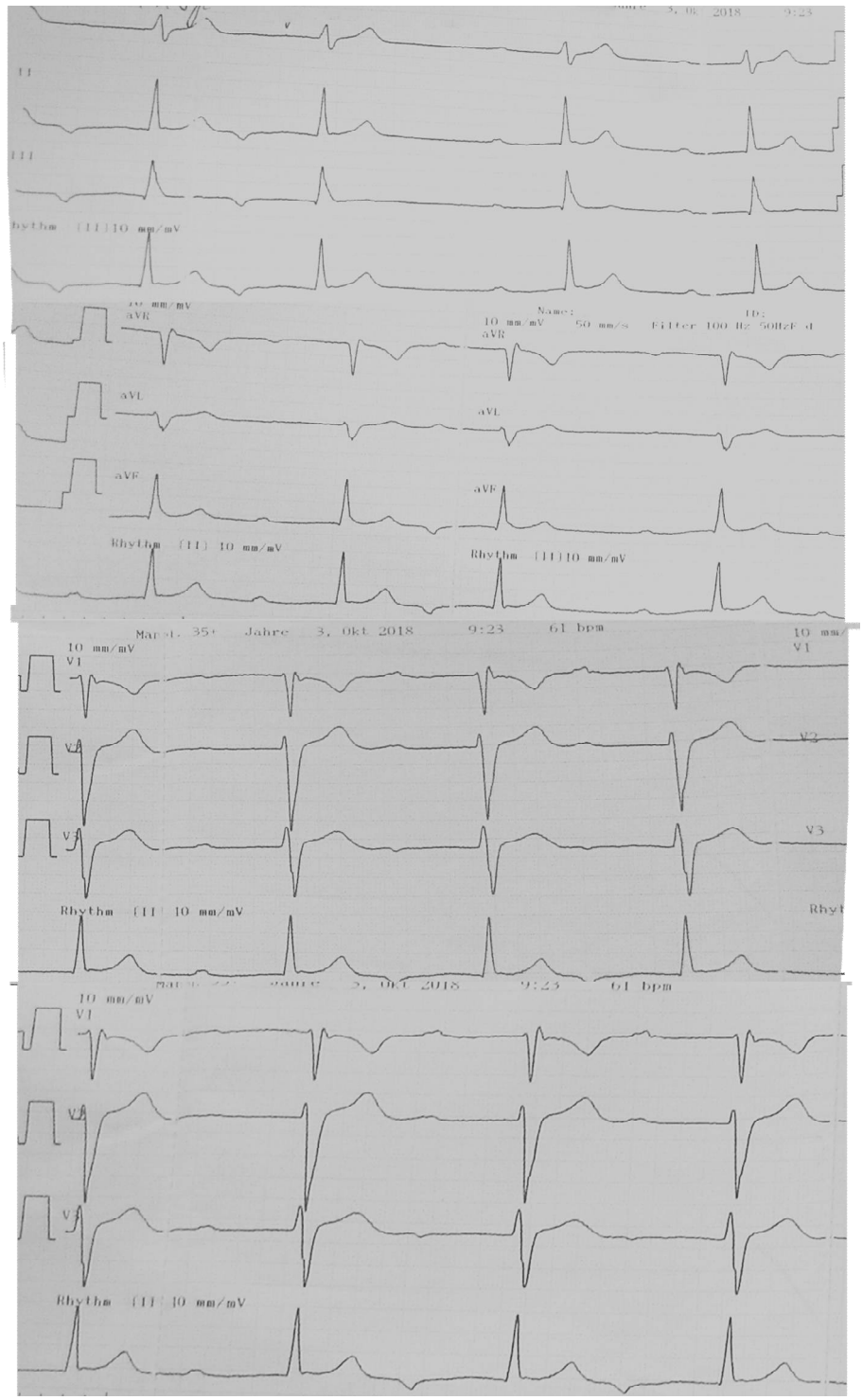

Fig. 5. ECG on the fifth day after admission. Distinctive atrioventricular type I heart block with extremely prolonged PR interval (400 ms). Episodes of ectopic atrial rhythm. Morphology of some P waves isn't typical for the sinus rhythm.

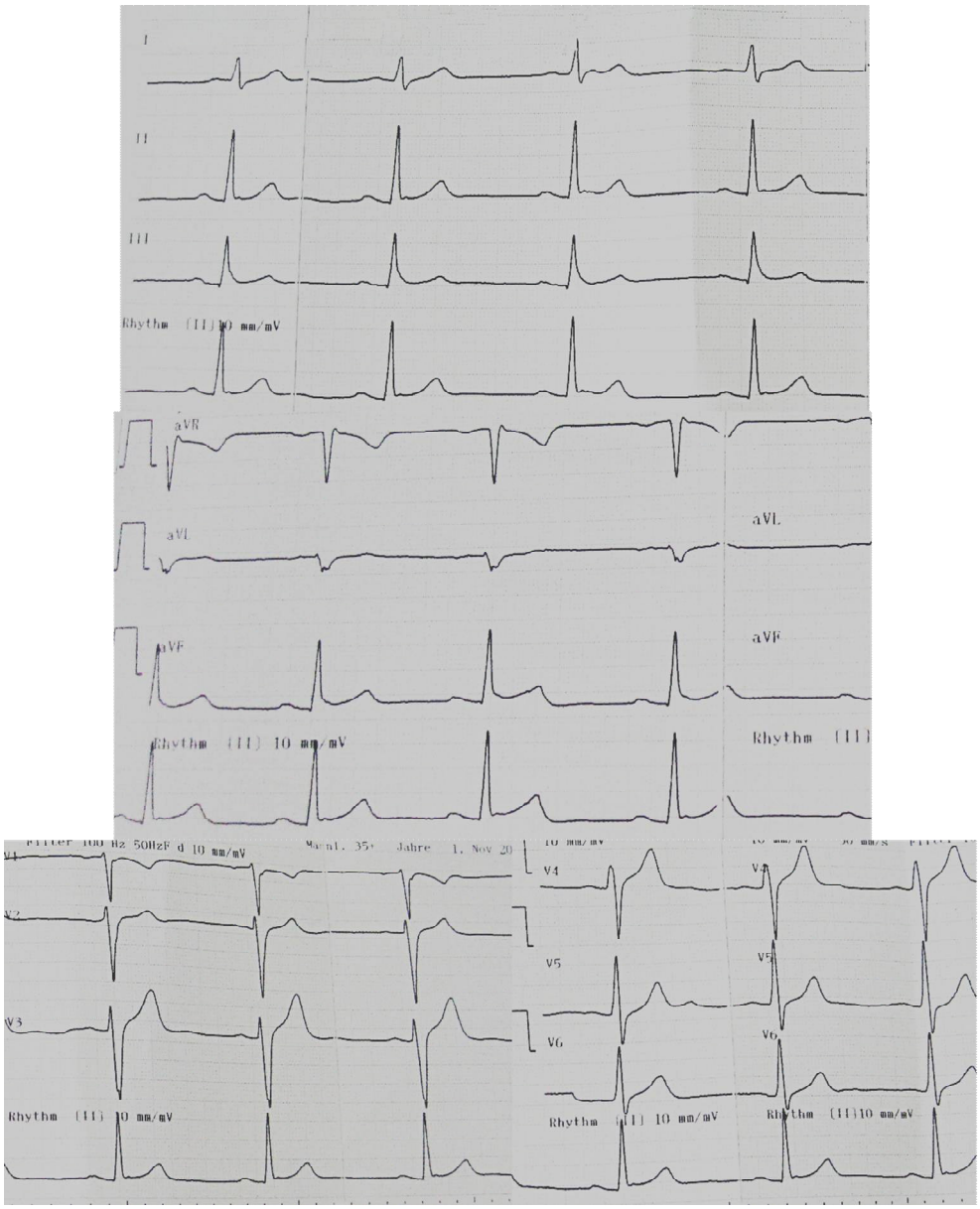

Fig. 6. ECG performed a month after hospitalization. Regular sinus rhythm. PR interval is 160 ms.

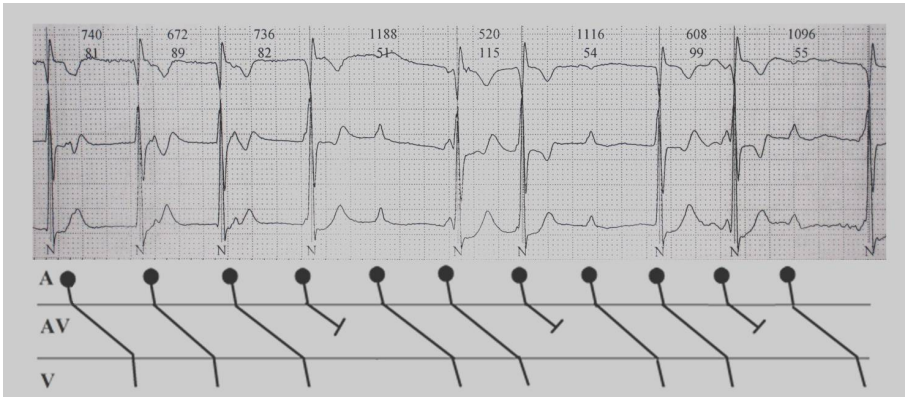

Fig. 7. 24-hour Holter monitoring performed on the third day after admission. Distinctive atrioventricular type I heart block with transition into Mobitz- type II atrioventricular block. There is three cycles of absence of QRS complex after every third P wave. PR interval after non-conducted P wave is not shorter than PR interval before non-conducted P wave.

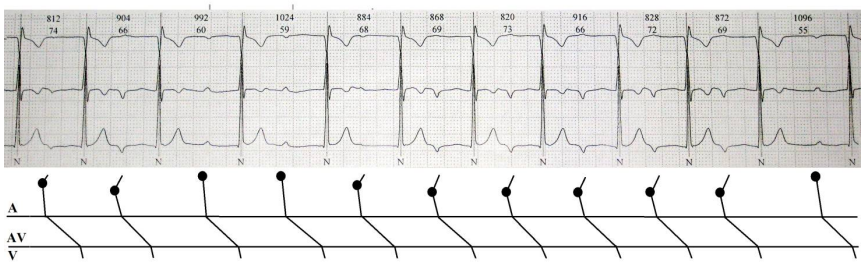

Fig. 8. 24-hour Holter monitoring performed on the third day after admission. Wandering atrial pacemaker and distinctive atrioventricular type I heart block. There are P waves of four different morphologies.

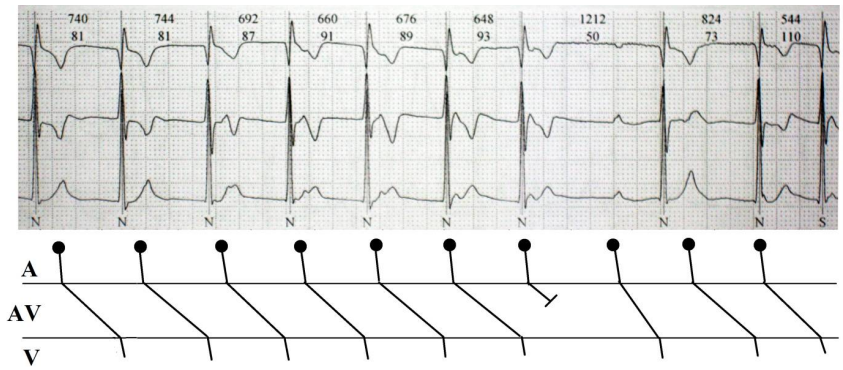

Fig. 9. 24-hour Holter monitoring performed on the third day after admission. Distinctive atrioventricular type I heart block with transition into Mobitz type II artioventricular block. PR interval after a non-conducted P wave is shorter than the PR interval before the non-conducted P wave.

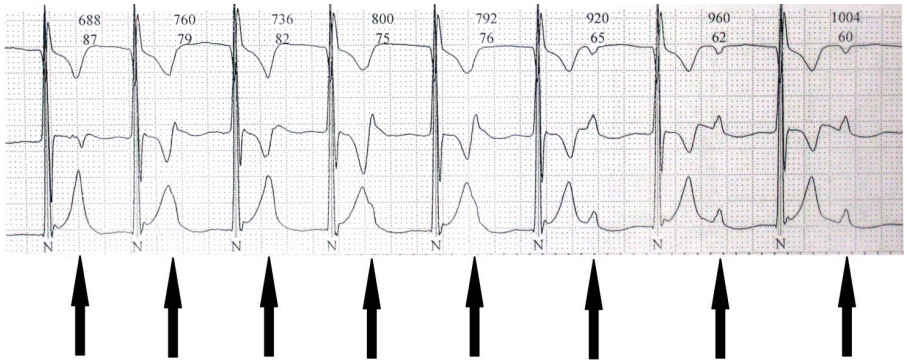

Fig. 10. 24-hour Holter monitoring performed on the third day after admission. Distinctive atrioventricular type I heart block. P waves are arrowed. The first 5 P waves merge with the previous T waves. The sixth, seventh and eighth P waves become obvious. On the background of almost constant PR intervals, TP interval gradually increases.

24-hour Holter monitoring results: The sinus rhythm is basic. Average heart rate is 78 bpm (day) and 60 bpm (night). Sustained distinctive atrioventricular type I heart block during all the period of monitoring. Episodes of Mobitz type I and Mobitz type II atrioventricular block. 14 pauses (with maximal duration of 2332 ms) were registered. Ectopic atrial pacemaker.

PR interval gradually shortened since the hospitalisation and became normal in one month. Neither permanent nor temporary pacing was used in the management of this patient. Distinctive atrioventricular type I heart block on the background of myocarditis may be benign with a complete restoration of the atrioventricular conduction. Indications to the routine permanent pacing should be reviewed; it should be recommended only when the PR interval doesn't shorten in dynamic (i.e. when atrioventricular block is irreversible).

Echocardiography reveals the second-degree prolapse of the anterior leaflet of mitral valve.

Following laboratory tests were abnormal: leukocytes – $11.3*10^9$/L, ESR – 15 mm/h, C-reactive protein – 24 mg/mL (2+).

Diagnosis: Acute myocarditis, unspecified. Distinctive atrioventricular type I heart block. Episodes of Mobitz type I and Mobitz type II atrioventricular block. Episodes of ectopic atrial pacemaker. Pseudo-pacemaker syndrome.

Discussion. It's likely that prolongation of the refractory period in the atrioventricular pathways is essential in the pathogenesis of the marked first-degree atrioventricular block. The atrioventricular node involves fast and slow pathways. The fast pathways have a longer refractory period [9]. In the case of refractory period prolongation, fast pathways are unable for the impulse conduction, because they are still in refractory state; but the slow pathways have a shorter refractory period and they can conduct the impulse. This leads to the prolongation of PR interval.

Mobitz type II atrioventricular block is characterized by an absence of the QRS complex after the P wave with a shortening of the PR interval after non-conducted P wave. There are main two subtypes of this block: classic Wenckebach and atypical Wenckebach. In the case of classic Wenckebach, there is progressive lengthening of the PR interval with the greatest increment in the second PR interval after non-conducted P wave. In the case of atypical Wenckebach, there is shortening or lengthening of the PR interval in the middle of a sequence; also, second PR interval after non-conducted P wave fails to show the largest increment [10].

According to the recommendations of the ACC/AHA (1998), for the patients with the distinctive atrioventricular type I heart block accompanied by pseudo-pacemaker syndrome and documented alleviation of symptoms with temporary AV pacing, the pacemaker implantation should be considered (IIaB). The implantation of dual chamber pacemaker may reduce symptoms and lead to an improvement in the functional state of patients, in whom shortening of the interval between atrial and ventricular contractions improves hemodynamics [11]. For asymptomatic patients with PR interval of ≥ 0.30 s., pacemaker is not recommended [12].

Conclusions. The distinctive atrioventricular type I heart block associated with pseudo-pacemaker syndrome creates diagnostic and management challenges in the real clinical practice. It may have a benign course with a gradual normalization of the PR interval. Recommendations for the permanent pacemaker implantation should be reviewed as this block may be completely reversible. The patients with a gradual shortening of the PR interval within the first few days may be closely monitored, and the need of pacemaker implantation may be assessed later. If there is no positive dynamic in the shortening of the PR interval, the implantation of pacemaker is indicated.

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КЛІНІЧНИЙ ВИПАДОК ВИРАЖЕНОЇ АТРІОВЕНТРИКУЛЯРНОЇ БЛОКАДИ ПЕРШОГО СТУПЕНЯ, АСОЦІЙОВАНОЇ З ПСЕВДОПЕЙСМЕКЕРНИМ СИНДРОМОМ

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Резюме. Виражена атріовентрикулярна (АВ) блокада першого ступеня діагностується при подовженні інтервалу PQ ≥ 0,30 с. Часто вона асоціюється з псевдопейсмекерним синдромом. Останній проявляється запаморочливими станами, синкопе, загальною слабкістю, задишкою при фізичних навантаженнях, кашлем, судомами, раптовою появою холодного поту, відчуттям пульсації у голові, шиї та животі, головним болем, нічними епізодами задишки, набряками нижніх кінцівок, тахіпное, пульсацією яремних вен. Ці симптоми пов'язані з тим, що у момент скорочення передсердь більша частина крові викидається не у шлуночки, а у легеневі вени з лівого передсердя та у порожнисті вени з правого передсердя, а також відсутністю наповнення шлуночків кров'ю у період систоли передсердь. Зубець Р появляється відразу ж після попереднього комплексу QRS.

Описано клінічний випадок вираженої атріовентрикулярної блокади першого ступеня, асоційованої з псевдопейсмекерним синдромом. Хворий поступив із передсинкопальним станом, що виник спонтанно, під час прогулянки парком, а також короткочасними запаморочливими станами, що турбували протягом останніх двох днів, шумом у вухах, відчуттям пульсації у животі, шиї, голові, що перешкоджало сну, загальною слабкістю. Ці скарги виникли після інфекційного захворювання, яке супроводжува-

лося нежиттю, першінням у горлі. У хворого на ЕКГ спостерігалося видовження інтервалу PQ до 0,7 с. Також виявлено АВ-блокаду другого ступеня, Мобітц-1 та Мобітц-2. За час спостереження у хворого інтервал PQ поступово укорочувався, і через 1 місяць досяг норми. Отож, виражена АВ-блокада першого ступеня може мати доброякісний характер з поступовою нормалізацією інтервалу PQ.

Ключові слова: виражена атріовентрикулярна блокада першого ступеня, псевдопейсмекерний синдром, подовжений інтервал PQ.

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КЛИНИЧЕСКИЙ СЛУЧАЙ ВЫРАЖЕННОЙ АТРИОВЕНТРИКУЛЯРНОЙ БЛОКАДЫ ПЕРВОЙ СТЕПЕНИ, АССОЦИИРОВАНОЙ С ПСЕВДОПЕЙСМЕКЕРНЫМ СИНДРОМОМ

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Резюме. Выраженная атриовентрикулярная (АВ) блокада первой степени диагностируется при удлинении интервала PQ ≥ 0,30 с. Часто она ассоциируется с псевдопейсмекерним синдромом. Последний проявляется головокружительными состояниями, обмороками, общей слабостью, одышкой при физических нагрузках, кашлем, отеками ног, судорогами, внезапным появлением холодного пота, чувством пульсации в голове, шее и животе, головной болью, ночными эпизодами одышки, тахипноэ, пульсацией яремных вен. Эти симптомы связаны с тем, что в момент сокращения предсердий большая часть крови выбрасывается не в желудочки, а в легочные вены из левого предсердия и в полые вены из правого предсердия, а также отсутствием наполнения желудочков кровью в период систолы предсердий. Зубец Р появляется сразу же после предыдущего комплекса QRS.

Описан клинический случай выраженной АВ-блокады первой степени, ассоциированной с псевдомейсмекерним синдромом. Больной поступил с предсинкопальным состоянием, которое возникло спонтанно, во время прогулки в парке, а также с жалобами на кратковременные головокружительные состояния, которые беспокоили в течение последних двух дней, шум в ушах, ощущения пульсации в животе, шее, голове, что препятствовали сну, общую слабость. Эти жалобы возникли после перенесенного инфекционного заболевания, которое сопровождалось насморком, першением в горле. На ЭКГ пациента наблюдалось удлинение интервала PQ до 0,70 с. Также обнаружено АВ-блокаду второй степени Мобитц-1 и Мобитц-2. За время наблюдения больного интервал PQ постепенно укорачивался и за 1 месяц достиг нормы. Итак, выраженная АВ-блокада первой степени может иметь доброкачественный характер с постепенной нормализацией интервала PQ.

Ключевые слова: выраженная блокада первой степени, псевдопейсмекерный синдром, удлиненный интервал PQ.

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