**Introduction.** Lyme disease, or tick-borne borreliosis, Lyme borreliosis (LB) is a naturally focal zoonosis caused by *Borrelia* of the genus *Borrelia* (*Borrelia burgdorferi*, *Borrelia garinii*, *Borrelia afzelii*), which belong to the class of gram-negative bacteria of the spirochete group and are transmitted to humans transmissibly by sucking ixodid tick. This disease is more often characterized by an acute course, although quite often it can have a protracted and chronic course with predominant damage to the skin, nervous, cardiovascular systems, and musculoskeletal systems [1, 2, 3].

According to the clinical manifestations of borreliosis infection, three stages are distinguished: the first is a local infection, when the causative agent penetrates the skin and migratory erythema is formed; the second corresponds to the manifestations of the disease with signs of damage to various organs as a result of the dissemination of the pathogen from the site of suction of the ixodid tick; the third – corresponds to the chronic course and is characterized by a spectrum of manifestations on the part of many organs for a long time [1-4]. In 20-40% of cases, LB develops without a primary erythematous form – with a primary-chronic course, which complicates clinical diagnosis and often contributes to the formation of disabling negative consequences – irreversible damage to the cardiovascular, nervous systems, etc. [5].

Today, among patients with a cardiology profile, there are cases of LB, which require joint differential diagnosis and appropriate treatment with infectious disease specialists [6]. Cardiac and neurological manifestations of LB, since they occur much less often than, for example, the classic picture of polyarthritis, were first described half a century ago, and then they were carefully studied [3]. Damage to the heart and nervous system usually begins 1-12 weeks after the onset of LB, that is, in the second stage [5]. Among the symptoms of damage to the cardiovascular system, the most common are atrio-ventricular and intraventricular conduction disorders, myocarditis, endocarditis, and dilated cardiomyopathy with the development of heart failure [3, 6, 7].

Immunopathogenesis involves the direct infiltration of *Borrelia burgdorferi* into the heart tissue – with its direct damage, then cells of the immune system are involved in the inflammatory process, contributing to the development of immunologically mediated damage to the heart and nervous tissues [8]. At the same time, many cases have been described when, after successful etiotropic treatment and long-term remission, spontaneous or induced by adverse factors reactivation of chronic LB occurs [9].

The special interest of doctors is because the COVID-19 pandemic caused massive population immunological changes, which also cannot but affect the possibility of reactivation of persistent chronic infections. Potential opportunities and dangers of reactivation of chronic infectious diseases (LB, chronic hepatitis B and C) were predicted long ago [10].

**The purpose of the work** is to use the example of a clinical case of reactivation of chronic Lyme borreliosis to demonstrate the peculiarities of its course, modern methods of diagnosis and treatment, as well as to confirm the potential impact of coronavirus disease on the possibility of reactivation of chronic infectious pathology, even with a mild course of the COVID-19 infection.

**Materials and methods.** Patient V., 35 years old, sought help from the regional center of clinical immunology and allergology of the communal non-profit enterprise “Ternopil Regional Clinical Hospital” of the Ternopil Regional Council. Clinical and anamnestic, epidemiological, laboratory (general clinical, immunoenzymatic, PCR) and instrumental (ECG, Holter monitoring, X-ray) examinations are used for the purpose of examination.

**Results and discussion.** The patient complained of general weakness, rapid fatigue, swelling and pain in the joints of the limbs, palpitations, and interruptions in the work of the heart, shortness of breath during moderate physical exertion. From the anamnestic, it is known that the symptoms of polyarthritides, palpitations, interruptions in the work of the heart, and slight shortness of breath arose about two weeks ago for no apparent reason. He does not drink alcohol, and does not smoke. In the last three weeks, he did not have a sore throat, respiratory or other infectious diseases. However, about two months ago, he suffered a mild form of coronavirus infection. The infection was confirmed by an express test, and after that, it was
confirmed by a PCR test. Taking into account the fact that the patient was vaccinated against COVID-19 three times in the previous year, as well as the mild course of the infection, the patient was treated at home, without the use of antibiotics, under the supervision of a family doctor. After recovery, the patient’s well-being quickly recovered, and the patient started work and tolerated normal physical activity well. During the further collection of the anamnesis, it was possible to find out that approximately 8 months ago, after a walk in the city park, he noticed a tick on himself. The patient did not pay due attention to this fact. He turned to the family doctor for help only after the appearance of annular erythema at the site of the bite. After examination for LB by immunoenzyme analysis, changes characteristic of primary LB-erythema (positive IgM and negative IgG) were detected [11, 12]. In connection with conducting a comprehensive international population survey of patients with Lyme disease, the patient underwent an immunological examination (Table 1). The patient was prescribed oral amoxicillin 1000 mg twice a day for 14 days. Clinically – disappearance of erythema, normalization of the general condition. After 1 and 3 months after the end of the treatment, the results of the examination for specific IgM to *Borrelia burgdorferi* were negative, which was considered as a cure [13, 14]. During the initial examination: the general condition is moderate, the consciousness is clear, the position in bed is active. Skin and visible mucous membranes are of normal color, lymph nodes are not palpable. Swollen, red and painful joints of the limbs (12 painful and 11 swollen joints in total). The pulse is 142 beats per minute, arrhythmic in the type of extrasystole. Auscultation: heart sounds are arrhythmic, weakened. Percussion of the heart: the limits of the relative dullness of the heart are normal. Blood pressure – 124/72 mm Hg. Art. Breathing is rhythmic with a frequency of 18/min. No pathological changes in the respiratory system and organs of the gastrointestinal tract were found. Pasternacki’s symptom is negative on both sides. There is no peripheral edema. The results. The results of the ECG examination: irregular sinus rhythm – ventricular extrasystole. The heart rate is 140 beats per minute. Atrioventricular blockade of the 1st degree. In the general blood analysis slight leukocytosis (9.8 G/l), without rod-nuclear shift, elevated ESR (42 according to Wintergreen). Rheumatoid factor – negative, C-reactive protein – 18.2 mg/l, CK-MV – 33.4 units/l. The results of other studies corresponded to the values of the age norm. In order to establish a diagnosis and carry out differential diagnosis, instrumental methods of diagnosis were also performed: echocardiography, Holter ECG monitoring, chest X-ray. Echocardiographic results of a clinical case. Heart chambers of normal size, left ventricular ejection fraction (LV) – 56%, LV diastolic dysfunction. Results of Holter ECG monitoring of a clinical case. Average daily heart rate – 108 bpm, ventricular extrasystole – 4-B class.

Taking into account the presence of heart rhythm disturbances, transient atrioventricular conduction disturbances and other signs of myocardial impression, such as weakening of tones, increased level of CPK-MV-fraction, decreased contractility of the myocardium, a diagnosis of mild myocarditis was made. Examined by a neurologist: there are no neurological symptoms. In order to further search for the etiological factor that led to the detected changes, the patient was re-interviewed for the presence of erythema migrans and tick bites. Since the specific lesions occurred for no apparent reason, and the symptoms appeared in winter, this made it possible to exclude the possibility of re-infection with Lyme borreliosis [8, 10]. During the further search for a potential causative agent that led to the detected changes, the patient was tested for the detection of antibodies to *Borrelia burgdorferi* by immunoenzymatic analysis. The obtained positive result in the detection of specific antibodies (IgM – 46.64 units/ml, IgG – 87.31 units/ml) indicated the reactivation of Lyme borreliosis. Taking into account the lack of epidemiological data typical for other infections and the history of non-infectious diseases; clinical data (rhythm disturbances and transient disturbances of atrioventricular conduction, which are characteristic of Lyme borreliosis; positive specific results of immunoenzymatic examination – (the presence of specific IgM and IgG in the blood), – the etiology of polyarthritis and myocarditis is confirmed as borreliosis. A comprehensive immunological examination of the patient was carried out (Table 1). At the same time, immunological changes were significantly deeper than during the initial episode of infection.

Therefore, the final diagnosis was formulated as follows: Lyme disease, late disseminated (reactivation induced by COVID-19). Subacute borreliosis polyarthritis, borreliosis myocarditis, mild course, heart failure I, functional class I, with preserved LV ejection fraction. Ventricular extrasystole. Transient atrioventricular blockade of the 1st degree. Treatment was prescribed: doxycycline 100 mg 2 times a day for 28 days, anti-inflammatory therapy. After completion of the course of etiotropic therapy, there was clinical remission, as well as negative results of specific IgM after 3, 6, and 12 months. The treatment carried out contributed to the gradual improvement of the general condition of the patient, and restoration of the results of ECG and echocardiogram examinations. Even when clinical and laboratory remission was achieved, immunological changes continued to be noted. Characteristically, even 3 months after achieving clinical remission, the patient had residual immunological...
changes. Only after 6 months, almost all indicators returned to normal values (Table 1). Therefore, the patient is under observation, taking into account the possible reactivation of LB.

### Table 1

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Primary episode</th>
<th>Reactivation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment</td>
<td>After 3 months</td>
</tr>
<tr>
<td>CD3+ cells, %</td>
<td>46</td>
<td>51</td>
</tr>
<tr>
<td>CD4+ cells, %</td>
<td>36</td>
<td>40</td>
</tr>
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<td>CD8+ cells, %</td>
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<td>15</td>
</tr>
<tr>
<td>CD16+ cells, %</td>
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<td>5</td>
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<tr>
<td>CD16+56+ cells, %</td>
<td>2.4</td>
<td>2.7</td>
</tr>
</tbody>
</table>

**Conclusions:**

1. COVID-19 infection can lead to the reactivation of chronic LB, which requires a detailed collection of complaints, objective and instrumental examination, as well as careful differential diagnosis for the exact appointment of adequate treatment.
2. Clinical vigilance of practical health care specialists regarding similar cases is necessary, even in the case of a mild course of the COVID-19 infection and in adequately vaccinated patients.
3. Immunological changes in case of reactivation of chronic LB last much longer than clinical and other laboratory changes. The persistence of immunological abnormalities may indicate a lack of stable remission and is the reason for longer and more careful monitoring of such patients.

**Conflict of interest.** There is no conflict of interest.

**REFERENCES:**

SUMMARY

CLINICAL AND IMMUNOLOGICAL FEATURES OF REACTIVATION OF CHRONIC LYME BORRELIOSIS AFTER A PREVIOUS INFECTION OF COVID-19

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A clinical case of reactivation of chronic Lyme borreliosis after a COVID-19 infection has been described.

The purpose of the study is to use the example of a clinical case of reactivation of chronic Lyme borreliosis to demonstrate the peculiarities of its course, and modern methods of diagnosis and treatment, as well as to confirm the potential impact of coronavirus disease on the possibility of reactivation of chronic infectious pathology, even with a mild course of the COVID-19 infection.

Materials and Methods. A diagnosis of borreliosis polyarthritis and Lyme myocarditis has been established. Since the specific lesions occurred for no apparent reason, and the symptoms appeared in winter, this ruled out the possibility of re-infection with Lyme borreliosis. During the further search for a potential causative agent that led to the detected changes, the patient was tested for the detection of antibodies to Borrelia burgdorferi by immunoenzymatic analysis.

Results and discussion. The obtained positive result in the detection of specific antibodies (IgM – 46.64 units/ml, IgG – 87.31 units/ml) indicated the reactivation of Lyme borreliosis. At the same time, the immunological changes were significantly deeper than during the initial episode of infection.

Treatment was prescribed: doxycycline 100 mg twice a day for 28 days, anti-inflammatory therapy. After completion of the course of etiotropic therapy, there was clinical remission, as well as negative results of specific IgM after 3, 6, and 12 months. Even 3 months after achieving clinical remission, the patient had residual immunological changes.

Conclusion. So, the clinical case shows the difficulties of establishing a diagnosis of reactivation of Lyme borreliosis, and the need for clinical vigilance of practical healthcare specialists regarding similar cases, even with a mild course of the COVID-19 infection, is emphasized.

Key words: Lyme borreliosis, COVID-19 infection, diagnosis, treatment, tick-borne borreliosis.

РЕЗЮМЕ

КЛІНІКО-ІМУНОЛОГІЧНІ ОСОБЛИВОСТІ РЕАКТИВАЦІЇ ХРОНІЧНОГО ЛАЙМ-БОРЕЛІОЗУ ПІСЛЯ ПЕРЕНЕСЕННОЇ ІНФЕКЦІЇ COVID-19

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Розглянуто клінічний випадок реактивації хронічного Лайм-бореліозу після перенесеної COVID-19 інфекції.

Мета роботи – на прикладі клінічного випадку реактивації хронічного Лайм-бореліозу продемонструвати особливості його перебігу, сучасні методи діагностики та лікування, а також підтвердити потенційний вплив коронавірусної хвороби на можливість реактивації хронічної інфекційної патології, навіть за умови легкого перебігу COVID-19 інфекції.

Матеріали і методи. Був виставлений діагноз бореліозного поліартриту, а за результатами лабораторного та інструментального обстеження – Лайм-міокардиту. Оскільки специфічні ураження відбулися без видимої причини, а симптоми з’явились взимку, це дозволило виключити можливість повторного інфікування Лайм-бореліозом.

У ході подальшого пошуку потенційного збудника, який призвів до виявлених змін, хворий був протестований на виявлення антигліб серобореліозу методом імуноферментного аналізу.

Результати та їх обговорення. Отриманий позитивний результат при детекції специфічних антитіл (IgM – 46,64 ОД/мл, IgG – 87,31 ОД/мл) вказував на реактивацію Лайм-бореліозу. При цьому імунологічні зміни були суттєво глибшими, ніж при первинному епізоді інфекції.

Призначено лікування: доксициклін 100 мг 2 рази/добу на 28 днів, протизапальна терапія. Після завершення курсу етіотропної терапії, клінічна ремісія, а також – негативні результати специфічних IgM через 3, 6 і 12 місяців. Характерно, що навіть через 3 місяці після досягнення клінічної ремісії, у пацієнта відзначалися залишкові імунологічні зміни.

Висновок. Отже, на клінічному випадку покаzanі складність встановлення діагнозу реактивації Лайм-бореліозу, негативні результати серобореліозу, а також – незначні зміни у відповідності до періоду інфекції.

Ключові слова: Лайм-бореліоз, інфекція COVID-19, діагностика, лікування, кліщовий бореліоз.
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The article was submitted to the editorial office on January 10, 2024.