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КЛИНИЧЕСКИЙ СЛУЧАЙ AL-АМИЛОИДОЗА С ПОРАЖЕНИЕМ ПЕЧЕНИ И РАЗВИТИЕМ НЕФРОТИЧЕСКОГО СИНДРОМА У МОЛОДОЙ ЖЕНЩИНЫ

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A Case Report of Al-Amyloidosis with «Hepatic Disguise» of Nephrotic Syndrome

Резюме

Амилоидоз характеризуется поражением нескольких систем органов, что приводит к более поздней постановке диагноза и прогрессированию патологического процесса. Представленный клинический случай демонстрирует длительный диагностический поиск у пациентки с AL-амилоидозом. В литературе наиболее часто описывают манифестацию заболевания с поражения почек, что проявляется нефротическим синдромом. Данный случай интересен тем, что поводом для госпитализации в стационар послужило поражение печени. Лабораторно обнаружены холестатический и цитолитический синдромы, дислипидемия. Был проведен дифференциально-диагностический поиск среди нозологий с поражением печени. В стационаре был впервые выявлен нефротический синдром и проведена пункционная нефробиопсия, позволившая установить диагноз AL-амилоидоза с сочетанным поражением желудочно-кишечного тракта, печени и почек.

Ключевые слова: *AL-амилоидоз, нефротический синдром, нефробиопсия*

Конфликт интересов

Авторы заявляют, что данная работа, её тема, предмет и содержание не затрагивают конкурирующих интересов

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Abstract
Amyloidosis is characterized by damage to several organ systems, which leads to diagnostic delays and progression of the pathological process. The described clinical case demonstrates a long diagnostic search in a patient with AL-amyloidosis. According to the literature, the most often described manifestation of the disease is kidney damage that manifests as nephrotic syndrome. This case is interesting because the reason for hospitalization was liver damage. Laboratory tests revealed cholestatic and cytolytic syndromes and dyslipidemia. Differential diagnostic included diseases with liver damage. In the hospital nephrotic syndrome was identified, renal biopsy was performed that proved the diagnosis of AL-amyloidosis with combined damage to the gastrointestinal tract, liver and kidneys.

Key words: *AL-amyloidosis, nephrotic syndrome, renal biopsy*

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Introduction

Amyloidosis is a group of diseases, the distinguishing feature of which is deposition of fibrillary glycoprotein amyloid in tissues and organs [1]. AL-amyloidosis is the most common and severe form of amyloidosis, where the precursor protein for fibrils is monoclonal light chains of immunoglobulins (λ-type chains in 74–80 % of cases) [2, 3].

The incidence of AL-amyloidosis is 3–12 cases per 1 million of population a year; however, autopsy results suggest that this value can be higher [4, 5]. AL-amyloidosis is more common in men; it is diagnosed mainly in the second half of their lives; the median age is 60 years old, while a share of patients under 50 years old is less than 10 % [6].

AL-amyloidosis is diagnosed in Waldenstrom's syndrome, multiple myeloma, but can be idiopathic (primary) [1].

Clinical forms of AL-amyloidosis are a result of a single causative factor — B-lymphocytic dyscrasia, characterised by formation of an abnormal clone of plasma cells or B-cells in bone marrow, which produce abnormal amyloidogenic immunoglobulins [1]. Accumulation of these immunoglobulins leads to impaired organ function, which is the key link in pathogenesis of amyloidosis and causes clinical manifestation of the disease.

One of the most common manifestations of AL-amyloidosis is kidney involvement and amyloid nephropathy with irreversibly progressive course and consistent alternation of stages: proteinuria, nephrotic syndrome, chronic renal insufficiency. Along with kidneys, pathological process in AL-amyloidosis can involve the following organs and systems: heart, where a clinical pattern of restrictive cardiomyopathy develops; GIT, with symptoms of severe diarrhoea or functional intestinal obstruction, which are usually associated with impaired intestinal motility because of dysfunctional vegetative nerve plexuses; liver, with development of cholestatic syndrome [1,7].

This clinical case demonstrates a long diagnostic search in a patient with liver and kidney involvement in AL-amyloidosis.

Clinical Study

Patient A., 43 years old, on December 24, 2022 was admitted to O. M. Filatov City Hospital No. 15 (Moscow) complaining of fatigue, lower limb swelling, significant enlargement of abdomen, weight loss, aphthaes, hair loss.

Her medical history shows that in August 2022 she started noting palpitations, susceptibility to hypotonia and hair loss; the patient consulted a GP at the place of her residence. Tests showed high cholesterol (according to the patient, 10.5 mmol/L). She was prescribed rosuvastatin 20 mg and was taking the medication for 2.5 months, then did not undergo any re-rests.

In September 2022, the patient lost 8 kg. In mid-November 2022, she started noting enlargement of abdomen and lower limb swelling. With these complaints, late in November 2022, she was hospitalised in the oncology dispensary, where the patient underwent laparotomy for the right ovary excision because of mucinous cystadenoma. During surgery, 3 L of yellow ascitic fluid was evacuated, and abdominal drainage was fitted.

The examination showed low total protein levels of 44 g/L, high erythrocyte sedimentation rate (35 mm/h), high levels of alkaline phosphatase (898 U/L), alanine aminotransferase and aspartate aminotransferase, platelets ($650*10^9$/L). Taking into account hypoproteinemia, edematose ascitic, cytolytic and cholestatic syndromes, hepatic cirrhosis was suspected, and symptomatic therapy was initiated. After discharge late in December 2022, the patient underwent abdominal IV contrast MRI, which revealed signs of ascites; focal lesions in the right lobe of liver; gastroepiploic and mesenteric lymph nodes with suspicious signs of pathologic infiltration; signs of liver disease. Since a neoplastic process was suspected and to rule out hepatic cirrhosis, a liver biopsy was performed, which came back with abnormal hepatocytes. To rule out hepatocellular carcinoma, an immunohistochemical assay was conducted: according to the morphological pattern and phenotyping results, hepatic tissue is oedematic, with focal necrotic and dysregeneratory changes in hepatic cells, which can be typical of toxic hepatosis. There were no reliable signs of tumour in this material. Therefore, metastases and hepatocellular carcinoma were ruled out; however, there were signs of toxic liver damage.

Since her condition was getting worse, the patient was admitted to City Clinical Hospital No. 15 of Moscow. Examination results upon admission: cachexia (body mass index: 15.7 kg/m^2), peripheral oedema of shins and feet, moderate trophic changes of lower limb skin, marginal sclera subicteritiousness, ulcerative stomatitis. Regular breathing, weaker in basal sections, without stridor; respiratory rate: 19/min, oxygen saturation: 97 %. Blood pressure on both arms: 115/70 mm Hg. Heart rate: 100 bpm, regular rhythm, muffled heart tones, without noises. The tongue is pale pink, wet, without plaque. Abdomen is symmetrical, enlarged by ascites; soft and painless to palpation. The liver is enlarged by 4 cm; its lower edge is pointed; the spleen is not palpated. The patient was susceptible to constipations. Urination is normal, 700 mL/day. History of chronic conditions: chronic gastritis, chronic colitis. Allergic to multivitamins. A family history of rheumatoid arthritis (mother).

ECG upon admission: sinus tachycardia, heart rate: 103 bpm, normal position of the electrical axis of the heart; low voltage of QRS complexes in all leads. Echocardiography results: cardiac chambers are of regular size; no left ventricle wall thickening over 1.1 cm during diastole; no areas of irregular regional contractility; Simpson's ejection fraction: 68 %; no signs of diastolic dysfunction; mitral valve leaflet prolapse to up 3 mm; stage 1 mitral and tricuspid regurgitation; pericardium — unremarkable.

Abdominal ultrasound examination: no portal hypertension; bulky lymphadenopathy. Laboratory test results allowed to rule out viral hepatitis B and C as a possible cause of the hepatic pathology. In order to rule out the autoimmune origin of the liver damage, a serologic examination was performed: markers of autoimmune liver damage — negative (antibodies (AB) to mitochondria, IgG+A+M titre: < 1:40; AB to liver and kidney microsome, IgG+A+M titre: < 1:40; AB to myeloperoxidase (MPO), IgG: < 1.5 rel. units/mL; AB to native DNA, IgG: 1.20 IU/mL; antinuclear antibody: < 1:160; AB to cardiolipin, IgG+A+M 9.50 rel. units/mL; AMA, IgG+A+M titre: < 1:40; SMA, IgG+A+M titre: < 1:40; AB to liver and kidney microsome, IgG+A+M titre: <1:40).

Laboratory test results (Tables 1, 2, 3) showed hypercholesterolemia, proteinuria (3.76 g/day), cylindruria, hypoproteinemia, hypoalbuminemia, corresponding to a laboratory pattern of nephrotic syndrome. During the entire period of hospitalisatin, the patient had high platelet count, resulting from nephrotic syndrome and hypercoagulation. Also, higher levels of gamma-glutamyltranspeptidase and alkaline phosphatase were reported, which corresponded to cholestasis syndrome.

Because of a combination of lymphadenopathy, ulcerative stomatitis and nephrotic syndrome, systemic lupus erythematosus was suspected, which was ruled out following an examination (low levels of AB to native duplex DNA, negative Smith antibody, negative antinuclear antibody, normal C3, C4 levels); also, this disease is not associated with leukocytosis, high platelet count, no articular syndrome, which were observed in the patient.

Since the process was systemic, and multiple organs were involved, primary amyloidosis was suspected.

On January 11, 2023, the patient underwent paracentetic renal biopsy (Figure 1, 2): the biopsy material contains 30 glomeruli; a majority of them have deposits of eosinophilic, PAS-negative cell-free masses in mesangium and walls of anses capillaires; intact walls of anses capillaires are not thickened, they have a single loop and diffuse-focal interstitial fibrosis and tubular atrophy, involving approximately 30–40 % of kidney parenchyma, with non-specific interstitial tissue infiltration with mononuclear cells in areas of fibrosis without tubulitis; orifices of some atrophic tubules have large protein cylinders; arteries and arterioles — unremarkable. Congo red staining: positive staining of the material infiltrating glomeruli, arteries and arterioles. When polarised light is used, there is an apple-green glow in projection of cell-free mass deposit. Immunofluorescence: IgG — negative. IgM+, λ+. IgA — negative. C3 — negative. C1q — negative. Kappa–cylinders+. λ — in projection of cell-free mass deposit ++, in interstitial tissue +++. Fibrin — negative. Conclusion: Renal amyloidosis (AL-amyloidosis).

A biopsy material for amyloidosis was collected during esophagogastroduodenoscopy; observations: oesophageal candidiasis, cardia insufficiency, superficial gastritis, chronic bulbitis with duodenitis. Biopsy results (Figure 3): the pieces of duodenum mucosa with focal haemorrhaging and vascular repletion of deep mucosa, stromal oedema, diffusive mild lymphoplasmacytic infiltration; Congo red staining reveals positive staining of amyloid deposits in vascular walls, mild positive staining of deep mucosa.

Table 1. *Dynamics of urine analysis during hospitalization.*

Parameter	Reference Value	26.12.2022	03.01.2023	11.01.2023	16.01.2023
Urine specific gravity, g/mL	1,010 — 1,025	1,017	1,023	**1,027**	**1,026**
Protein semi-quantitative, g/L	0	**3,00 (3+)**	**3,00 (3+)**	**6,00 (3+)**	**3,00 (3+)**
24-hour urine protein, g/L	0,00 — 0,15		**3,76**		
Erythrocytes, cells in the field of view	0	0	0	0	0
Leukocytes, cells in the field of view	0 — 3	1	1	2	1
Hyaline casts, cells in the field of view	0	**2**	**1**	**1**	**2**
Bacteria, cells in the field of view	0	0	0	0	0

Table 2. *Dynamics of biochemical blood test parameters.*

Parameter	Reference Value	24.12.2022	26.12.2022	03.01.2023	12.01.1023
Alanine aminotransferase, U/L	0 — 41	**72,1**	**63,0**	**51,0**	**52,1**
Albumin, g/L	35 — 52		**20,5**	**21,5**	
α-Amylase, U/L	25 — 115		36,8		
Aspartate aminotransferase, U/L	0 — 40	**87,8**	**77,0**	**59,0**	**70,6**
Total bilirubin, μmol/L	1,7 — 21	16,7	11,9	10,4	14,3
Gamma-glutamyl transferase, U/L	0 -38		**552,0**		
Potassium, mmol/L	3,5 — 5,1		4,50		
Creatinine, μmol/L	53 — 97		87,0	106,0	
Glomerular filtration rate using to the formula CKD-EPI, ml/min/1,73m^2	>60		70	**55**	
Lactate Dehydrogenase, U/L	120 — 246		348,0	330,0	
Uric Acid, μmol/L	155 — 357		234		
Urea, mmol/L	2,6 — 7,2		7,20	7,80	
Sodium, mmol/L	135 — 151		132,0		
Total protein, g/L	66 — 88		**39,7**	**42,7**	
Thyroid-stimulating hormone, mIU/L	0,27 — 4,2		2,57		
Total cholesterol, mmol/L	3,1 — 5,2		**9,89**		
Alkaline Phosphatase, U/L	70 — 290		**1958,0**	**1799,0**	

Table 3. *Dynamics of clinical blood test parameters.*

Parameter	Reference Value	24.12.2022	03.01.2023	10.01.2023	16.01.2023
Hemoglobin, g/L	120 — 140	**114**	**96**	**112**	**108**
Erythrocytes, cells*10^9/L	3,9 — 4,7	3,5	3,2	**3,0**	3,5
Thrombocytes, cells*10^9/L	150 — 450	**647**	**574**	**522**	**546**
Leucocytes, cells*10^9/L	4,0 — 9,0	**11,6**	**17,6**	**9,6**	**12,5**

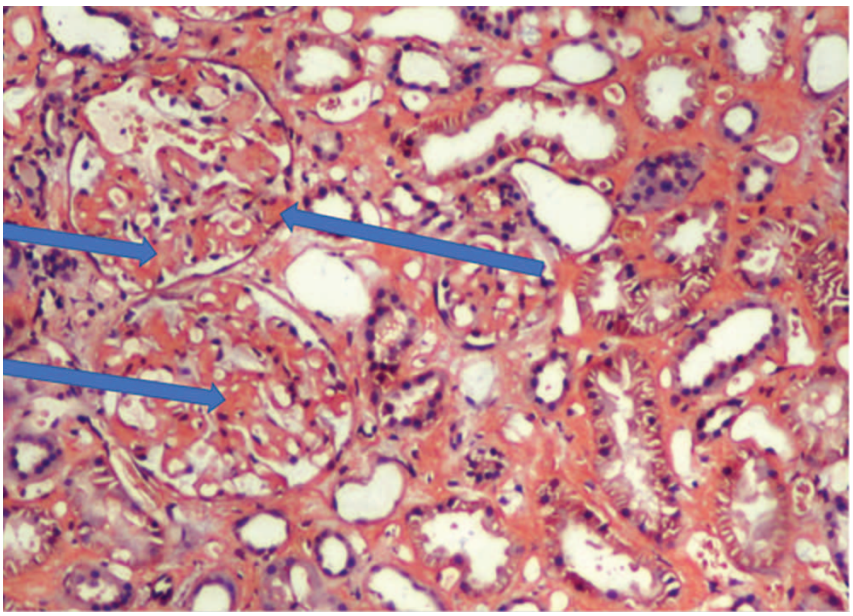

Figure 1. *Kidney specimen, Congo red staining — positive staining of material infiltrating the glomeruli, arteries and arterioles*

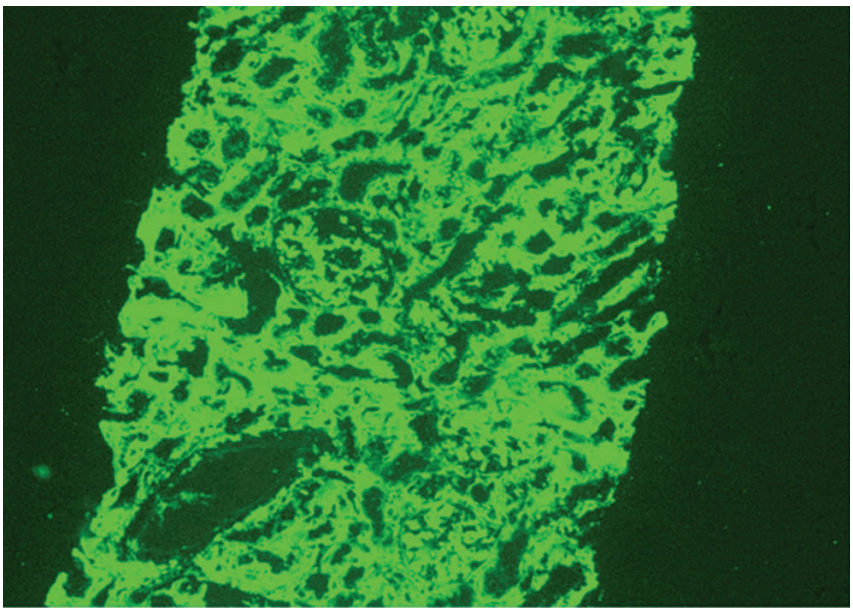

Figure 2. *Kidney specimen, immunofluorescence. Immunofluorescence staining shows deposition of lambda chains*

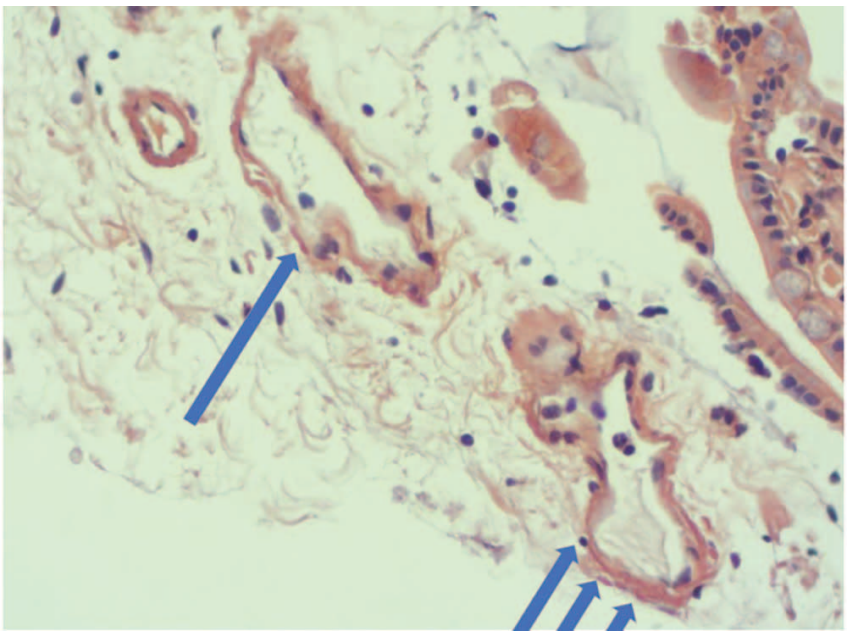

Figure 3. *Biopsy of the duodenum (the arrows indicate amorphous pinkish-red masses around the vessels in the duodenum specimen)*

The patient was diagnosed with AL-amyloidosis with renal (nephrotic syndrome), GIT and hepatic involvement.

The patient was treated symtomatically: diuretics — to arrest circulatory overload in nephrotic syndrome, isolated abdominal dropsy (oral furosemide 80 mg and oral spironolactone 150 mg), albumin infusions to correct hypoalbuminemia; as well as glucocorticosteroid (GCS) therapy (prednisolone 45 mg/day).

The patient was consulted by a haematologist; a sternal puncture was performed to rule out multiple myeloma: plasma cells — 4.8 %. Also, she underwent scull, rib and hip X-ray examination: no signs of destruction. There were no reliable signs of multiple myeloma. The patient was recommended to have a consultation by a haematologist at the place of her residence in order to rule out a lymphoproliferative disorder, since immunofluorescence results do not rule out an underlying light chain disorder.

Upon discharge, patient's condition has improved: reduction of oedema and ascites, absence of subicteritiousness of sclera, normal diuresis. It was recommended to continue GCS therapy (45 mg/day) and diuretics (furosemide 40 mg/day and spironolactone 25 mg/day) in outpatient settings.

Discussion

According to Russian and foreign literature, one of the most common manifestations of AL-amyloidosis is a full-scale clinical and laboratory picture of nephrotic syndrome [1, 8]. In this case study, the disease started with liver involvement — a laboratory picture of symptoms of cholestasis and cytolysis. Liver involvement in a pathological process in AL-amyloidosis is observed almost in 100 % of cases. At the same time, the liver function often remains normal [1]. Clinical hepatic manifestations are observed just in 30 % of patients and usually are enlarged liver and an isolated increase in serum alkaline phosphatase levels without any signs of hepatic insufficiency [9]. According to a pathomorphological study of 46 liver biopsy materials of patients with amyloidosis, AL-amyloidosis was diagnosed in 87 % of cases. 15 % of these patients had signs of hepatic encephalopathy with ascites and hepatomegalia [10].

In this clinical case, in inpatient settings the patient was diagnosed with nephrotic syndrome, and renal biopsy was performed in order to make a final diagnosis of systemic amyloidosis. A morphological examination is crucial in diagnosis of amyloidosis. Amyloid is capable of double reflection, which is seen as the glow of amyloid samples, pre-stained with Congo red, in polarised light, with change of the red colour of congophilic amyloid deposits to apple-green (dichroism) [1]. In order to identify the composition of amyloid, immunofluorescent staining was performed, which is more sensitive both for the diagnosis of AL-amyloidosis and its typing vs. immune histochemical study (65 % to 85 % vs. 38 % to 87 %, respectively) [11].

Recently, there is a growing number of reports on AL-amyloidosis cases, where liver is the only organ involved [12, 13], and it significantly hinders diagnosis, since initial symptoms are non-specific. In this clinical case, despite systemic involvement, oedemic and ascitic syndrome and hepatomegalia were the key to the clinical picture and led to a long differential diagnosis search among conditions associated with liver damage: cancer (since the patient had a history of ovary adenocystoma, liver metastases were ruled out); autoimmune liver damage, cirrhosis, toxic hepatitis, hepatocellular carcinoma. Since early diagnosis is crucial for the prognosis in such patients, it is justified to share this clinical case with irregular manifestations.

Such patients are treated in specialised facilities using high doses of GCS in combination with chemotherapy. In AL-amyloidosis, it is essential to completely inhibit proliferation of plasma cell clone [1].

In this case, GCSs were used as pathogenetic therapy; and after discharge, the patient was recommended to undergo an examination by a haematologist at the place of the patient's residence in order to decide on the use of chemotherapeutic agents.

Conclusion

This case study demonstrates the relevance of timely diagnosis of systemic diseases, particularly of AL-amyloidosis. Involvement of several systems of organs as a result of pathological proliferation of the precursor protein and amyloid deposition in various tissues make it challenging to single out the leading symptom of the disease; hence, late diagnosis and pathologic process progression. The main criterion to diagnose AL-amyloidosis is biopsy results of the affected organ. Low suspicion of this disease by various medical specialists results in a long diagnostic search and, thus, aggravation of the patient's condition without proper management. Therefore, it is essential to treat each case more attentively, where irregular manifestations are observed, in order to perform any diagnostic procedures and make a correct clinical diagnosis as soon as possible.

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Список литературы / References:

1. Лысенко (Козловская) Л.В., Рамеев В. В., Моисеев С. В. и др. Клинические рекомендации по диагностике и лечению системного амилоидоза. Клин фармакол тер. 2020; 29(1): 13-24 Lysenko (Kozlovskaya) L.V., Rameev V. V., Moiseev S., et al. Clinical guidelines for diagnosis and treatment of systemic amyloidosis. Klinicheskaya farmakologiya i terapiya = Clin Pharmacol Therapy 2020; 29(1):13-24 [In Russian]. DOI: 10.32756/0869-5490-2020-1-13-24.
2. Desport E., Bridoux F., Sirac C., et al. Centre national de référence pour l'amylose AL et les autres maladies par dépôts d'immunoglobulines monoclonales. Al amyloidosis. Orphanet J Rare Dis. 2012 Aug 21; 7: 54. DOI: 10.1186/1750-1172-7-54.
3. Manwani R., Cohen O., Sharpley F., et al. A prospective observational study of 915 patients with systemic AL amyloidosis treated with upfront bortezomib. Blood. 2019; 134(25): 2271-2280. DOI: 10.1182/blood.2019000834.
4. Pinney J. H., Smith C. J., Taube J. B., et al. Systemic amyloidosis in England: an epidemiological study. Br J Haematol. 2013 May; 161(4): 525-32. DOI: 10.1111/bjh.12286.
5. Kyle R. A., Larson D. R., Kurtin P. J., et al. Incidence of AL Amyloidosis in Olmsted County, Minnesota, 1990 through 2015. Mayo Clin Proc. 2019 Mar; 94(3): 465-471. DOI: 10.1016/j.mayocp.2018.08.041.
6. Falk R. H., Comenzo R. L., Skinner M. The systemic amyloidoses. N Engl J Med. 1997; 337(13): 898-909. DOI: 10.1056/NEJM199709253371306.
7. Vaxman I., Gertz M. When to Suspect a Diagnosis of Amyloidosis. Acta Haematol. 2020; 143(4): 304-311. DOI: 10.1159/000506617.
8. Gertz M. A., Comenzo R., Falk R. H., et al. Definition of organ involvement and treatment response in immunoglobulin light chain amyloidosis (AL): a consensus opinion from the 10th International Symposium on Amyloid and Amyloidosis, Tours, France, 18-22 April 2004. Am J Hematol. 2005; 79(4): 319-28. DOI: 10.1002/ajh.20381.
9. Loustaud-Ratti V. R., Cypierre A., Rousseau A., et al. Non-invasive detection of hepatic amyloidosis: FibroScan, a new tool. Amyloid. 2011; 18(1): 19-24. DOI: 10.3109/13506129.2010.543443.
10. Михалева Л. М., Гиоева З. В., Рёкен К. Гистологическое и иммуногистохимическое исследования в диагностике амилоидоза печени. Архив патологии. 2015; 77(4):11-16. [Mikhaleva L. M., Gioeva Z. V., Rëken K. Histological and immunohistochemical examinations in the diagnosis of hepatic amyloidosis. Russian Journal of Archive of Patology. 2015; 77(4): 11-16. (In Russ.)]. DOI: 10.17116/patol201577411-16.
11. Picken M. M. New insights into systemic amyloidosis: the importance of diagnosis of specific type. Curr Opin Nephrol Hypertens. 2007; 16(3): 196-203. DOI: 10.1097/MNH.0b013e3280bdc0db.
12. Zhang X., Tang F., Gao Y. Y., et al. Hepatomegaly and jaundice as the presenting symptoms of systemic light-chain amyloidosis: A case report. World J Gastrointest Oncol. 2024 Feb 15; 16(2): 550-556. DOI: 10.4251/wjgo.v16.i2.550.
13. Kottavadakkeel N., Rajaram A. Hepatic Involvement as the Sole Presentation of Systemic Amyloid Light Chain (AL) Amyloidosis: A Diagnostic Challenge. Cureus. 2023 Oct 19; 15(10): e47310. DOI: 10.7759/cureus.47310.