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FEATURES OF CLINICAL AND LABORATORY MANIFESTATIONS AND RESULTS OF TREATMENT OF LIVER ECHINOCOCCOSIS

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Abstract: Relevance. Echinococcosis, being a parasitic disease, still continues to be a serious problem not only in the medical, but also in the national economic system. The purpose of the study. To study the features of clinical and laboratory manifestations in the complex traditional surgical treatment of liver echinococcosis. Material and methods. The results of the traditional treatment of 298 patients with liver echinococcosis who were treated and examined at the Bukhara Regional Multidisciplinary Medical Center from 2010 to 2015 were analyzed. Results and their discussion. When assessing the peculiarities of changes in clinical and laboratory parameters, we proceeded from the principle of randomization of patients primarily based on the principle of the morphofunctional state of the echinococcal cyst itself. Based on this, the analysis of the characteristics was carried out in a comparative aspect between patients with live parasites, dead parasites and complicated liver echinococcosis. At the same time, when evaluating changes in patients with complicated forms of liver echinococcosis, at the first stage we estimated the average statistical value of all types of complications of the disease. Conclusions. The modern view of the immunological reactions of the body in liver echinococcosis focuses on the use of diagnostic tests that reflect only the level of a specific reaction of the body. The issues related to the immunological reactions of the body in various variants of liver echinococcosis remain debatable, and therefore open.

Key words: clinical and laboratory manifestations, results, treatment, liver echinococcosis.

Relevance. Echinococcosis, being a parasitic disease, still continues to be a serious problem not only in the medical, but also in the national economic system [1, 3, 5, 25, 26, 27].

A characteristic feature of echinococcosis, which determines its relevance, is the recognition of its problem in many countries of the world due to the large number of patients and the existence of endemic areas. The regions of our country are no exception, especially the regions with a priority livestock sector [2, 4, 6, 8, 28, 29, 30].

It is known that echinococcus in humans more often affects the liver, lungs, abdominal and retroperitoneal organs. To date, surgical methods for the treatment of echinococcosis remain the only reliable ones. This statement has been repeatedly reflected in the resolutions of a number of international symposia and conferences [7, 9, 11, 13, 15].

Meanwhile, the results of the operation cannot always be considered comforting. There is still a high percentage of postoperative complications, the lion's share of which (up to 32.8%) is purulent-septic [10, 12, 14, 16, 18, 27].

Statistical data from various literary sources provide data on the high incidence of complications such as suppuration, bleeding, and fistula formation [17, 19, 21, 23]. Great difficulties in the treatment process also arise when eliminating residual cavities after removal of a parasitic cyst [20, 22, 24].

The purpose of the study. To study the features of clinical and laboratory manifestations in the complex traditional surgical treatment of liver echinococcosis.

Material and methods. The results of the traditional treatment of 298 patients with liver echinococcosis who were treated and examined at the Bukhara Regional Multidisciplinary Medical Center from 2010 to 2015 were analyzed. The distribution of patients by age revealed the predominance of patients in the age range from 41 to 60 years, that is, during the period of active labor activity. At the same time, the range of age variance of patients in the control group decreased both towards young and elderly age. Female patients prevailed among the patients, mainly aged 51-60 years. It should be noted that this category of age rank determined the average proportion among all patients in this group with a predominance of the number in favor of rejuvenation of the pathological process. Among male patients, patients in the age group from 41 to 50 years prevailed.

Comparing the age categories of patients in the control group, it can be noted that there were more young patients among males (almost 3 times). At the same time, the number of elderly and senile patients was higher among female patients (4.4 times).

The distribution of patients by the nature of the disease showed the prevalence of primary forms of liver echinococcosis, which accounted for 2/3 of the total volume of patients in the control group. To a lesser extent, recurrent and residual forms of the pathological process were diagnosed. Single forms of liver echinococcosis prevailed, which were almost 2 times more than multiple.

In total, 399 echinococcal liver cysts were detected in 298 patients. On average, there were 1.3 cysts per patient.

The distribution of patients by cyst diameter showed that formations with diameters from 10 to 14 cm (34.6%) prevailed. Cysts ranging in size from 15 to 19 cm (26.1%) and from 6 to 9 cm (25.8%) were almost equally significant. 42 patients had echinococcal cysts varying 5 cm in diameter (all of them are multiple) and 12 patients had giant cysts (more than 20 cm in diameter). The localization of echinococcal cysts in liver segments also had a definite tendency, depending on the mono- or bisegmental location of the formation.

Thus, it can be noted that the favorite localization of echinococcal cyst was recorded by us in patients of the control group in the VII-VIII segments of the liver (36.3%). The locations in the II-IV and V-VI segments of the liver were almost in the same proportion (23.1% and 29.3%, respectively).

To a lesser extent, there were patients with localization of echinococcal cysts in the VI-VII and I segments of the liver (8.5% and 2.8%, respectively).

According to the clinical forms in patients of the control group, in 51.0% of cases the disease was not complicated (uncomplicated echinococcosis of the liver). Accordingly, in 146 patients, that is, in 49.0% of cases, a complication of the pathological process was noted.

In more than half of the cases of complications, suppuration of an echinococcal cyst was noted (53.4%). Such suppuration variants were isolated in various stages of the purulent-inflammatory process.

As mentioned above, a total of 399 echinococcal liver cysts were detected in 298 patients. In 34.3% of cysts were with a living parasite, 29.1% - with a dead one, and in 36.6% of cases there were complicated forms of liver echinococcosis due to the addition of a purulent inflammatory process.

Among the cases with a dead parasite, we noted variants of a dead parasite in the stage of early postmortem changes in 9.3% of cases and a dead parasite in the stage of late postmortem changes in 19.8% of cases. However, not in all cases, preoperative diagnosis, including even the use of MSCT, did not allow differentiating the transient (intermediate) status of the parasite.

Among the complicated forms of liver echinococcosis, cases with banal cyst suppuration (53.4%) and cyst suppuration with a breakthrough into the intrahepatic bile ducts with the development of cholangitis and jaundice prevailed (37.0%). This variant in most cases depended on the segmental localization of the echinococcal cyst.

The complication of echinococcosis of the liver in the form of isolated suppuration often occurred with classic signs of a purulent inflammatory process. Of the 298 surgical treatments performed, open echinococcectomies accounted for the lion's share (80.9%). Closed echinococcectomy, which was performed in 47 (15.8%) patients, was divided into 3 subgroups: closed ideal echinococcectomy (8.4%), cyst removal with organ resection (3.0%) and closed cystpericystectomy (4.4%). Combined open and closed echinococcectomy was performed in 10 (3.4%) patients. The distribution of patients depending on the methods of elimination of residual cavities after open echinococcectomy of the liver showed the predominance of methods of capitation with external drainage (62.2%). Among the other methods of eliminating residual cavities after open echinococcectomy from the liver, the leading ones were conventional capitation (19.5%), and capitation with intussusception of the fibrous capsule (6.6%).

In almost the same proportion, such methods of eliminating residual cavities after open echinococcectomy from the liver as capitation with resection of a part of the fibrous capsule (3.7%), omentaplasty (2.9%), aplatization (2.5%) and marsupialization (2.5%) were used.

Thus, presenting the general characteristics of patients with liver echinococcosis, a number of interesting points can be highlighted, namely, firstly, the randomization of the group naturally shows the reliable statistical significance of the conducted research analysis. Secondly, when analyzing clinical and laboratory signs of the course of liver echinococcosis, it requires the exclusion of errors in variational values, which are possible due to the impressive number of patients with a complicated form of the disease. Based on this, it seems to us that the optimal way may be through the use of cohort analysis from the entire group, depending on the nature and state of vital activity of the parasite, as well as the morphological essence of the pathological substrate itself.

Results and their discussion. When assessing the peculiarities of changes in clinical and laboratory parameters, we proceeded from the principle of randomization of patients primarily based on the principle of the morphofunctional state of the echinococcal cyst itself. Based on this, the analysis of the characteristics was carried out in a comparative aspect between patients with live parasites, dead parasites and complicated liver echinococcosis. At the same time, when evaluating changes in patients with complicated forms of liver echinococcosis, at the first stage we estimated the average statistical value of all types of complications of the disease.

The hemoglobin level differed significantly between patients, depending on both the nature of the vital activity of echinococcosis and the nature of the disease (Table 1).

Table 1. The nature of the distribution of the average value of clinical laboratory blood parameters among patients of the control group

indicator	The nature of the cyst	The nature of the cyst's vital activity		
		Alive	Dead	Complicated
Hemoglobin (g/l)	Primary	122,6±18,7	106,2±18,4	97,4±12,5
	Residential	112,1±14,4	96,3±16,5	86,3±13,9*

	Recurrent	107,8±21,9	91,7±15,8*	72,4±11,4*
Red blood cells (×1012/l)	Primary	3,57±0,77	3,23±0,34	3,01±0,12*
	Residential	3,37±0,21	3,12±0,13	2,91±0,13*
	Recurrent	3,22±0,18	3,01±0,12*	2,73±0,12*
White blood cells (x109/l)	Primary	6,21±1,12	10,34±2,32*	14,65±2,42*
	Residential	7,81±1,15	11,93±1,32*	15,93±1,11*
	Recurrent	8,82±1,21*	11,96±3,01*	16,11±1,17*
Lymphocytes (%)	Primary	36,21±9,32	36,14±12,26	25,31±7,11*
	Residential	32,47±8,17	30,87±9,83*	22,95±4,92*
	Recurrent	31,92±7,33*	29,32±6,34*	20,82±2,57*
Eosinophils (%)	Primary	5,2±0,1	4,8±0,8	7,2±0,3*
	Residential	5,8±0,8	3,7±0,5*	8,1±0,5*
	Recurrent	6,1±0,2	3,1±0,7*	9,9±0,2*
ESR (mm/h)	Primary	10,9±2,2	11,4±3,3	20,8±4,9*
	Residential	14,1±3,9	12,5±3,9	22,4±4,8*
	Recurrent	14,8±1,4*	14,3±1,1*	25,4±2,7*

* $p<0.05$ – the ratio of the corresponding indicator to primary live echinococcosis is significant

Among patients with various types of echinococcal cyst with a living parasite, the difference in blood hemoglobin levels was not significant ($p<0.1$; CI: 85.9:141.3). At the same time, among patients with a dead echinococcal cyst, reliable values in relation to live primary echinococcosis were noted by us with a recurrent nature of the disease ($p<0.05$; CI: 75.9:107.5).

As for patients with a complicated form of liver echinococcosis, the hemoglobin level was significant in residual (CI: 72.4:100.2) and recurrent (CI: 61.0:83.8) forms of it ($p<0.05$) compared with primary live echinococcosis. The dispersion of erythrocyte levels corresponded to the nature of hemoglobin changes and confirmed signs of anemia in patients with a complicated form of primary, residual and recurrent liver echinococcosis (Table 1).

Moreover, in all cases with a complicated form, changes in this indicator were at the level of reliable values in relation to patients with live primary echinococcosis of the liver ($p<0.05$; CI: 2.61:3.13). The same pattern of decrease in erythrocyte levels was diagnosed by us among patients with dead recurrent liver echinococcosis ($p<0.05$; CI: 2.89:3.13).

Thus, changes in the level of hemoglobin and erythrocytes among patients with various forms of liver echinococcosis confirm the data on the possible development of anemia with complication of the disease, and with recurrent forms these changes become more pronounced. However, along with this, in patients with recurrent echinococcosis of the liver in its dead form, such changes become just as characteristic.

The level of leukocytes in patients with live echinococcus varied at the upper limit of normal values, increasing from the primary form towards residual and recurrent forms. At the same time, if in patients with living primary liver echinococcosis the confidence interval varied from 5.99x109/l to 7.24 x109/l, then in patients with recurrent liver echinococcosis this indicator already varied from 7.61x109/l and up to 10.03 x109/L.

In patients with dead echinococcosis, the level of leukocytes in the blood was significantly higher for all types of the disease in relation to primary living liver echinococcosis ($p<0.05$). However, the value of the confidence interval in patients with primary dead liver echinococcosis was closer to those in patients with living recurrent liver echinococcosis (CI: 8.02:12.66 and CI: 7.61:10.03, respectively; $p<0.1$).

The overall variation in the level of leukocytes in the blood of patients with dead liver echinococcosis ranged from 8.02 x109/l to 14.97 x109/l. In the dispersion value, only 50% of patients with dead liver echinococcosis had characteristic leukocytosis, indicating early signs of the onset of the inflammatory process.

As evidence, data on the level of white blood cells in patients with complicated forms of liver echinococcosis can be cited. As we have already noted, in most cases these complications were purulent-inflammatory in nature. Accordingly, the value of changes in the level of this indicator in all cases was significant ($p<0.05$), and the confidence interval in complicated primary and residual forms of liver echinococcosis was at the level of the dispersion cloud of values for both dead residual and recurrent forms of liver echinococcosis (CI: 12.23:17.04 and CI: 10.61:14.97, respectively). The only exception may be cases of complicated recurrent forms of liver echinococcosis, the value of which was significant both in relation to the corresponding indicators among patients with dead and living echinococcal cyst ($p<0.05$).

Echinococcosis of the liver is characterized by a decrease in the level of blood lymphocytes. The overall confidence interval ranged from 18.25% to 45.63%. All complicated forms of the disease and dead cysts with residual and recurrent forms of liver echinococcosis were distinguished by reliable values in relation to primary living liver echinococcosis. Speaking about the recurrent form of the disease, even among the living forms of echinococcosis, significant changes were noted in comparison with the primary form of the pathological process. The lowest values of lymphocytes in the blood were noted by us among patients with complicated forms of liver echinococcosis 23.03±4.87%. At the same time, we found high values of lymphocyte levels in the blood among patients with live echinococcal liver cyst – 33.53±8.27%. This nature of the change indicates a close connection with the development of complications associated with purulent-inflammatory processes.

For liver echinococcosis, characteristic eosinophilia was noted by us among patients with live (CI: 5.1:6.3) and complicated (CI: 6.9:10.1) forms of echinococcal cyst. Among patients with a dead echinococcal cyst, a slight increase in eosinophils was noted only in the case of primary forms of the disease (CI: 4.0:5.6). Although eosinophilia was detected in 75% of patients in the control group (CI: 5.6:10.1), nevertheless, patients with only complicated forms of liver echinococcosis were distinguished by reliable values.

The rate of erythrocyte sedimentation in patients with complicated forms of liver echinococcosis was significantly accelerated (CI: 15.9:28.1) compared with uncomplicated (CI: 8.7:15.6) forms of the disease ($p<0.05$). High variability and numerical values in complicated forms of liver echinococcosis were associated with inflammatory changes, a detailed analysis of which will be described below.

When analyzing the biochemical parameters of blood, hypoproteinemia can be isolated in patients with complicated forms of liver echinococcosis (CI: 58.1:69.5). The reliability of these values in relation to uncomplicated forms of the disease was expected to be characteristic ($p<0.05$), although it could not fully assess the nature of the pathological process itself (Table 2).

Hypoproteinemia in patients with complicated forms of liver echinococcosis was due to hypoalbuminemia, the level of which was minimal among patients of this category. The lowest values were observed among patients with recurrent complicated forms of liver echinococcosis (CI: 18.7:22.9), which was 2 times lower than in patients with the primary form of the disease in the presence of a living parasite ($p<0.05$).

Against this background, we noted a relative increase in globulins among patients with this form of the pathological process. So, if in patients with living primary echinococcosis of the liver, the level of globulins was taken beyond the starting values (CI: 30.72:46.56), then in patients with complicated forms of echinococcosis of the liver, the variation was significantly higher both in primary cyst (CI: 49.08:54.86) and in residual cyst (CI: 47.48:56.82) and recurrent (CI: 50.14:56.44), respectively ($p<0.05$).

Table 2. The nature of the distribution of the average value of biochemical laboratory blood parameters among patients of the control group

Indicator	The nature of the cyst	A variant of the nature of the cyst's vital activity		
		Alive	Dead	Complicated
Total protein (g/l)	Primary	81,2±6,9	70,8±2,9	68,4±1,1
	Residential	84,3±4,3	70,2±1,3	64,9±0,9*
	Recurrent	81,4±3,9	70,1±1,1	58,6±0,5*
Albumin (g/l)	Primary	43,1±4,8	42,8±3,3	26,9±1,8*
	Residential	42,4±3,1	40,5±3,1	22,4±2,2*
	Recurrent	41,9±2,9	39,6±2,1	20,8±2,1*
Globulins (%)	Primary	38,64±7,92	44,36±3,12	51,97±2,89*
	Residential	36,29±6,24	43,81±2,83	52,15±4,67*
	Recurrent	38,71±8,99	43,45±3,13	53,29±3,15*
Total bilirubin (mmol/l)	Primary	11,82±1,81	14,83±2,38	70,12±21,83*
	Residential	13,63±2,73	14,92±2,44	81,91±18,38*
	Recurrent	12,94±1,73	15,88±3,19*	68,23±15,77*
Direct bilirubin (mmol/l)	Primary	3,55±0,84	3,56±0,24	28,05±9,72*
	Residential	4,09±0,49	3,58±0,49	32,76±8,71*
	Recurrent	3,88±0,77	3,81±0,33	27,29±5,32*
AsAt (IU/l)	Primary	21,35±1,99	26,83±2,12	45,27±6,99*
	Residential	22,18±2,17	25,99±2,83	47,93±7,38*
	Recurrent	21,94±2,04	26,12±2,66	46,12±9,12*
AlAt (ME/l)	Primary	25,12±2,81	28,93±2,49	56,38±12,49*
	Residential	26,01±1,94	29,84±2,67	51,14±11,43*
	Recurrent	25,11±1,85	29,99±3,36	57,92±10,83*
Thymol sample (units)	Primary	2,12±0,38	6,48±0,98*	33,91±6,48*
	Residential	2,19±0,29	7,12±1,03*	34,82±7,99*
	Recurrent	2,23±0,44	7,33±1,12*	38,66±5,12*
Urea (mmol/l)	Primary	4,72±0,92	5,11±1,24	12,92±2,13*
	Residential	4,18±1,04	6,01±1,68*	13,78±2,33*
	Recurrent	4,99±1,11	6,98±1,99*	14,65±2,19*
Creatinine (mmol/l)	Primary	82,45±21,91	91,84±23,89	138,56±29,03*
	Residential	84,98±23,58	99,37±25,43	152,18±31,77*
	Recurrent	85,17±20,11	101,99±18,33	167,23±26,91*

* $p<0.05$ – the ratio of the corresponding indicator to primary live echinococcosis is significant

Such a significant interest of globulins and albumins in patients with complicated forms of liver echinococcosis, in our opinion, directly characterizes the severity of the pathological processes in the body. This nature of the changes led to changes in the structure of globulin fractions.

The level of globulin fractions was characterized by high values in patients with complicated forms of liver echinococcosis.

The most significant changes were noted in relation to the fraction of γ-globulins in patients with recurrent complicated hepatic echinococcosis, which exceeded the level in patients with live primary hepatic echinococcosis by 1.6 times ($p<0.05$).

Relatively low values of α2-globulins in patients with live residual (7.13±1.12%) and recurrent (7.13±1.32%) with echinococcal cyst of the liver, followed by an increase in values in patients with complicated forms of the disease (11.09±2.35% in primary, 11.12±1.92% in residual and 11.21±1.42% in recurrent).

At the same time, relative to the level of α1-globulins, low values should be noted in patients with primary (3.98±0.11%) and residual (4.02±0.25%) complicated form of liver echinococcosis.

Low values of β-globulins were observed in patients with a live residual echinococcal cyst of the liver (10.12±1.09%), and maximum values were observed in patients with a complicated recurrent form of the disease (13.21±1.61%). In both the first and second cases, they were not reliable, which once again confirms the diagnostic significance of only gamma globulins.

The level of total bilirubin (Table 2) in the blood significantly exceeded the physiological parameters in patients with a complicated form of liver echinococcosis, which was most likely due to the presence of mechanical jaundice in most patients ($p<0.001$). The average level of total bilirubin in patients with a complicated form of liver echinococcosis exceeded normal values by more than 5 times. As a confirmation of the importance of mechanical jaundice, the consistency of the data with the level of the direct fraction of total bilirubin can be presented. The maximum values were noted among patients with a complicated form of residual echinococcal liver cyst.

Severe biliary insufficiency was accompanied by increased transaminase activity in patients with complicated forms of liver echinococcosis. All this may indicate the presence of destruction of hepatocytes, exacerbating an already difficult process (Table 2).

The development of liver failure was also proved by the presence of a high level of thymol test parameters, to a greater extent in patients with complicated forms of liver echinococcosis. The level of increase in thymol samples in patients with primary complicated liver echinococcosis was 16 times higher than in the case of a living cyst ($p<0.001$). We obtained the same data when comparing between residual and recurrent liver cysts.

The urea level in patients with live echinococcal cyst averaged 4.63±0.93 mmol/l. In patients with a dead parasite, the urea level was significantly higher, reaching an average of 6.03±1.12 mmol/l. However, azotemia was more pronounced in patients with complicated forms of liver echinococcosis, on average exceeding the values of the first subgroup of patients at 13.78±2.65 mmol/L. The excess of urea in the blood in patients with purulent-inflammatory complications averaged 2.99 times.

A similar pattern of changes was noted in relation to creatinine. On average, the increase in this indicator in patients with a complicated form of liver echinococcosis was 1.81 times. The peak difference was noted between patients with recurrent cysts (1.96 times), and the minimum - with primary cysts (1.68 times).

The severity of azotemia could also be associated with the addition of renal dysfunction, which developed against the background of generalization of infection in complicated forms of liver echinococcosis.

The indicators of endogenous intoxication in patients with various forms of liver echinococcosis also did not change unambiguously. In particular, it should be noted that in complicated forms of liver echinococcosis, these indicators exceed the values than in patients with uncomplicated variants of the disease. We pointed this out in the chapter of the literature review, where most of the studies were devoted to predicting the form of the disease.

To a certain extent, our data corresponded to generally recognized trends, but questions related to the significance of certain indicators of endogenous intoxication did not receive an unambiguous answer.

The percentage of significance of LII in patients with complicated forms of liver echinococcosis ranged from 58.6% to 59.9% (on average 59.2%).

The maximum level of changes was noted among patients with recurrent echinococcosis, and the minimum – with residual. At the same time, in relation to patients with a living parasite, an increase in LII was noted by 3.44 times, and in relation to patients with a dead parasite – by 2.52 times (Table 3).

The confidence interval range among patients with uncomplicated form of liver echinococcosis was 1.2:2.05 units, and among patients with complicated form of the disease in the range of 3.2:5.91 units. The comparative characteristics of these changes were reliable (p<0,05).

Table 3. The nature of the distribution of the average value of LII (units) in patients of the control group

The nature of the cyst	A variant of the cyst's vital activity		
	Alive	Dead	Complicated
Primary	1,32±0,12	1,66±0,19	4,32±1,12*
Residential	1,29±0,09	1,88±0,11	4,49±0,94*
Recurrent	1,38±0,04	1,91±0,14	4,92±0,99*

*p<0.05 – the ratio of the corresponding indicator to primary live echinococcosis is significant

A significant increase in CRP levels was also expressed among patients with complicated forms of liver echinococcosis (table 4).

Table 4.

The distribution of the mean value of CRP (mg/l) in patients of the control group

The nature of the cyst	A variant of the cyst's vital activity		
	Alive	Dead	Complicated
Primary	2,21±0,17	4,97±1,11	187,54±12,43*
Residential	2,36±0,12	5,48±1,03*	190,33±11,98*
Recurrent	2,93±0,11	6,77±2,01*	197,87±12,16*

*p<0.05 – the ratio of the corresponding indicator to primary live echinococcosis is significant

The average level of its significance was 95.9% among all patients. So, if among patients with living primary echinococcosis of the liver, the CRP level was 2.21±0.17 mg/l, then in patients with complicated primary echinococcosis of the liver it increased to 187.54±12.43 mg/l (p<0.001). At the same time, if in relation to dead forms of the parasite, the proportion of CRP in patients with complicated forms of the disease exceeded 33.9 times, then in relation to liver echinococcosis with a living parasite, the excess was 77.68 times.

This indicator (CRP) among patients with uncomplicated liver echinococcosis was minimal in its primary form (the average between living and dead parasites was 3.59±0.91 mg/l; p<0.05). The increase in the average CRP level among patients with the primary form of liver echinococcosis was due to a dead parasite (4.97±1.11 mg/l; p<0.05). In other words, a certain significance of an increase in CRP levels may prognostically indicate the condition of a parasitic cyst in patients with uncomplicated liver echinococcosis. The evidence for our judgments can be the average increase in CRP in patients with a dead parasite (5.74±0.88 mg/l; p<0.05) over a live one (2.5±0.3 mg/l). Such changes were more typical among patients with a residual and recurrent form of the disease.

Procalcitonin, a marker of generalization of the inflammatory process, was distinguished by intermediate significance.

The average level of its increase in patients with complicated forms of liver echinococcosis was 68.94%. The minimum level was noted in relation to primary echinococcosis of the liver (68.5%), and the maximum – to the recurrent form (69.43%).

The excess of procalcitonin in patients with a complicated form of liver echinococcosis in relation to patients with a dead echinococcal cyst was 3.72 times, whereas in relation to a living parasite it was 5.56 times. In the first case, the minimum increase was noted in relation to the primary (by 3.38 times), and the maximum – to the recurrent (by 3.91 times). In the second case, the minimum increase was noted in relation to the residual (5.17 times), and the maximum – to the primary form of the disease (6.1 times).

The average value of procalcitonin among patients with complicated forms of liver echinococcosis was 3.4±0.43 pg/ml ($p<0.05$) with a minimum level among patients with primary (3.11±0.12 pg/ml; $p<0.05$) and maximum – with recurrent (3.68±0.98 pg/ml; $p<0.05$) liver echinococcosis.

In patients with uncomplicated forms of liver echinococcosis, the average level of procalcitonin was (0.77±0.09 pg/ml) with a minimum level among patients with live (0.62±0.08 pg/ml; $p<0.05$) and with a maximum – with dead (0.91±0.55 pg/ml; $p<0.05$) echinococcus. At the same time, we registered the minimum level of procalcitonin in patients with primary living liver echinococcosis (0.51±0.02 pg/ml), and the maximum in patients with recurrent dead liver echinococcosis (0.94±0.07 pg/ml).

In general, the change in the level of procalcitonin in patients with liver echinococcosis was noted by us at a significant level among patients with complicated forms of the disease. At the same time, there may be certain differences among patients with uncomplicated forms of the disease, which depend on both the condition of the parasite and the form of the disease.

The data obtained are consistent with the known information of other clinicians. In particular, the distinctive difference in the indicators of endogenous intoxication in patients with a complicated form of liver echinococcosis is crucial. In this regard, we believe that the analysis of changes in these blood parameters should be carried out according to the relative level.

Thus, the assessment of the initial value of laboratory parameters in patients with liver echinococcosis may indicate their differentiated value primarily among patients with complicated and uncomplicated forms of the disease. It is also necessary to cancel separately significant changes in biochemical parameters characterizing liver disorders associated with impaired bile formation (hepatic jaundice) and its passage (mechanical jaundice). We have demonstrated this information using specific clinical examples.

At the same time, through a retrospective analysis, we have identified a number of interesting points that can reveal borderline changes among patients with uncomplicated liver echinococcosis themselves. These data are also of some importance in terms of accounting for them and carrying out appropriate preoperative preparatory measures that were not carried out among patients from the control group.

Taking into account the conclusion made, it can be assumed that a separate assessment of complicated forms of liver echinococcosis in patients of the control group and the identification of unsatisfactory immediate or long-term treatment results will, in our opinion, determine priorities and ways to improve the results of treatment of patients with this disease.

We analyzed the results of treatment of patients based on the criteria of immediate and long-term results.

As the scale gradation showed, in 92 (30.9%) patients, the immediate treatment results averaged 18.2±2.8 units, which corresponded to the range of "good" criteria. At the same time, in 44 (14.8%), the range of criteria fluctuated at the level of 19.1 ± 0.9 units, and in 48 (16.1%) patients – at the level of 16.8 ± 0.8 units, that is, at the boundary level between "good" and "satisfactory" results.

In general, 159 (53.4%) patients of the control group were identified in the confidence interval of the criteria for "satisfactory" results (CI: 7:15). Within this subgroup, the predominant part (27.2%) consisted of 81 patients at the level of 9.9±2.2 units. In 26 patients, the average level of the criteria scale was 14.4±0.5 units. But there were patients who were on the verge of "satisfactory" and "unsatisfactory" results, who were enrolled in the first category due to the advantage of the statistical value of the digital deviation (CI: 7:7.7).

Regarding the results of the "unsatisfactory" category, which were noted by us, 44 (14.8%) patients did not differ in any wide range of fluctuations, due to the reliability of certain criteria and their combination simultaneously in a small number of patients.

The mortality rate was 1.0% (3 patients) as a result of the development of severe postoperative complications that led to dysfunction of several organs at the same time.

When evaluating each gradation, it can be noted that closed ideal echinococcectomy was performed in 47 (15.8%) patients. At the same time, open echinococcectomy was performed in 80.9% of cases (241 patients). In 10 patients (3.4%), we performed combined, i.e. open and closed echinococcectomy, including organ resection.

At the end of the early postoperative period, 148 (49.7%) patients had already achieved the elimination of the residual liver cavity as a result of the use of effective methods of capitulation after removal of an echinococcal cyst of the liver. If in 19.5% of cases the usual atypical capitation was performed, then in 3.7% of cases the capitation was combined with resection of a part of the fibrous capsule. At the same time, in 16 patients, that is, in 6.6% of cases, the fibrous capsule was invaginated into the cystic cavity of the liver.

However, in 62.2% of cases, capitonage was completed by external drainage, in order to create a constant active aspiration of the formed contents of the residual liver cavity. At the same time, in 89 (29.9%) patients, as a result of the use of such tactics of administration of the postoperative period, a complete reduction occurred after drainage removal. At the same time, 61 (20.5%) patients still had a residual cavity at the end of the early postoperative period, which, accordingly, required the abandonment of drainage or the replacement of the latter with a thinner diameter. When it was difficult to eliminate the residual liver cavity with their own liver tissues, omentaplasty (2.9%) or marsupilization (2.5%) was performed.

Postoperative complications were assessed by dividing them into local and general. There were no local postoperative complications in 188 (63.1%) patients. In the remaining patients, local postoperative complications were subdivided by us depending on the treatment method used. The first category included postoperative complications that did not require repeated surgical intervention for the underlying disease. These complications were often combined in a combination of 2-3 complications per patient, but in general there were 68 (22.8%) patients.

To a greater extent (8.4%), these were patients who had suppuration of the postoperative wound. In 4.7% of cases, we detected the development of a ligature fistula of the postoperative bed. The infiltration of the postoperative wound and the wound around the drainage tube was formed in 10 (3.4%) patients. In 9 (3.0%) patients, we successfully diagnosed the development of postoperative wound seroma, the timely elimination of which made it possible to reduce the proportion of suppurative complications. Another 6 (2%) patients developed partial (marginal) necrosis of the wound skin as a result of suture tension. At the same time, 4 (1.3%) patients were diagnosed with subcutaneous hematoma in the area of the postoperative wound.

In general, as our statistical data show, for all of the above patients with postoperative local complications, the use of any special surgical operations was in no way required.

We intentionally state this fact, since in 42 (14.1%) patients, in the postoperative period, with local complications, the use of surgical intervention methods was required.

We noted the most of all such complications in 13 (4.4%) patients as a result of the formation of fistulas communicating with internal organs, in particular with the liver (bile), and body cavities (pleural, abdominal). Such fistulas were eliminated by us in the subsequent periods of observation of patients. In 11 (3.7%) patients in the postoperative period, as a result of the failure to reduce the residual liver cavity and the addition of a secondary infection, their suppuration occurred according to the type of liver abscesses. The elimination of such complications was carried out by percutaneous external drainage of the residual liver cavity under the control of ultrasound, followed by sanitation until its complete elimination. If there is no effect from the therapy, the operation was performed during the "cold period" of the disease.

Unfortunately, in 6 (2.0%) patients, as a result of total suppuration of the postoperative wound and divergence of sutures, the eventration of the large omentum or loop of the small intestine occurred. Complications of this type were eliminated urgently by eliminating the eventration with the imposition of compression sutures on the wound through all layers.

Osteomyelitis of the rib is another type of local complication that developed in the postoperative period in 5 (1.7%) patients. All these patients underwent thoracophrenolaparotomy, with the intersection of the cartilage of the costal arch. Operations of this kind were performed in other patients, however, a complication was noted in patients with complicated forms of liver echinococcosis, more associated with a cyst breakthrough into the pleural cavity.

Another 5 (1.7%) patients developed peritonitis of various types (mainly biliary) and prevalence (limited and diffuse) in the postoperative period. At the same time, in 2 patients, peritonitis was ongoing and even after surgery for a cyst breakthrough into the free abdominal cavity. The elimination of such peritonitis was carried out urgently after the preparation of the patient, provided that it was possible to evacuate the contents of the abdominal cavity through drains. However, with the progression of paralytic intestinal obstruction as a result of bile flow into the free abdominal cavity, the operation was performed on an emergency basis.

We noted postoperative intra-abdominal bleeding in 2 (0.7%) patients who underwent emergency surgery.

Thus, as can be seen from the above material, postoperative complications of a local nature, especially those requiring repeated surgical intervention, in most cases acted as a starting point for the development of general complications that exacerbate the already serious condition of the patient.

There were no general complications in 71.8% of patients in the postoperative period. In other cases, all of them were divided into complications that were easily eliminated and did not require special treatment and the involvement of non-surgical specialists (45 patients – 15.1%), as well as complications requiring additional treatment with the involvement of non-surgical specialists (39 patients - 13.1%). As can be seen, the level of correlation between the frequency of registration of complications of these two groups was close to identity.

In the first category, 23 (7.7%) patients developed exudative pleurisy, which in all cases was inflammatory and was eliminated by punctures of the pleural cavity. In another 5.0% of cases (15 patients), right–sided pleural empyema was diagnosed, which was eliminated by puncture in 5 (1.7%) patients, in 3 (1.0%) patients – by microthoracocentesis, and in 7 (2.33%) patients - by thoracocentesis with a two-light silicone drainage of the TMMC type.

Acute urinary retention in the early postoperative period developed in 7 (2.33%) patients of the control group, which was eliminated by catheterization of the bladder. In all cases, these were elderly male patients with concomitant pathology of the prostate gland.

Such common complications as the development of acute bronchopneumonia (5.7%), sepsis (3.4%), liver failure (1.7%), myocardial infarction (1.0%), acute cerebral impairment and acute renal failure (0.7% in each category) occurred in the early postoperative period and were treated with the involvement of non-surgical specialists.

As can be seen from the above material, complications in patients in the early postoperative period, both local and general, in most cases were inflammatory in nature, indicating the presence of violations in the protective properties of the body. The nature of these disorders, even if they were effectively eliminated in a timely manner, to a certain extent had its effect on the long-term postoperative period.

Long-term results were evaluated by us upon repeated examination of patients within 3 months and 1 year after surgery. It should be noted that during this period, 6 (2.0%) patients died from various somatic diseases unrelated to surgery and underlying pathology.

3 months after the operation, 1 (0.3%) patient died, 294 (98.7%) patients were examined, including according to the outpatient chart. In 78.5% of patients, complete obliteration of the residual cavity in the liver was detected. Along with this, 42 (14.1%) patients were diagnosed with reduction of the residual cavity in the liver in a volume of more than 50% of the initial value. All these cases did not require surgical intervention. In 6.0% of cases (18 patients), during this elapsed time, reduction of the residual cavity in the liver still did not occur and surgical intervention was indicated due to the patient's anxiety about the phenomena of the inflammatory process. It should be noted that according to the immediate results of treatment, there were 61 patients with a residual cavity in the liver. At the same time, after 3 months, only 71.5% of patients achieved reduction during this period of outpatient treatment (Table 5).

After 6 months, of the remaining number of patients in the control group, 3 more (1.0%) patients died. 291 (97.7%) patients were examined. Complete obliteration of the residual liver cavity was achieved in 89.6% (267 patients) of cases. Unlike the previous follow-up period, by the 6-month period, another 20 (6.7%) patients had achieved reduction of the residual cavity in a volume of more than 50%, which did not require the use of special surgical intervention. The decrease in the number of patients in this category in the period of 6 months was 2.1 times. However, still in 4 (1.3%) patients, reduction of the residual cavity did not occur despite the repeated establishment of percutaneous drains in the previous follow-up period. This number accounted for only 6.6% of the "unsatisfactory" immediate results of treatment of patients, decreasing 4.5 times compared to the previous period of treatment.

Table 5. Dynamics of changes in the residual cavity in the long-term period after liver echinococcectomy

The condition of the residual cavity	**Dynamics of observation**					
	3 months		**6 months**		**12 months**	
	A.ч.	**%**	**A.ч.**	**%**	**A.ч.**	**%**
Complete obliteration	234	78,5	267	89,6	285	95,6
Reduction >50%	42	14,1	20	6,7	4	1,3
Reductions <50%	18	6,0	4	1,3	0	0
Died during this period	1	0,3	3	1,0	2	0,7
TOTAL PATIENTS	294	98,7	291	97,7	289	97,0

We have not noted any patients with a residual cavity in the liver that would require repeated surgical intervention a year after surgery. During this period, 2 (0.7%) patients died and 1.3% of patients still had a residual cavity in the liver, although it was reduced by more than 50% and did not require repeated surgical intervention.

An analysis of the outcome of the underlying disease in the dynamics of the long-term period after echinococcectomy surgery showed that after 3 months there were no signs of recurrence of the disease in all examined patients (Table 6).

However, after 6 months, in 17.4% (52 patients) of cases, according to ultrasound and MSCT, the presence of small residual cysts of an inoperable nature was diagnosed. After another 6 months, despite a 2.3-fold decrease in the proportion of patients with the presence of formed small residual cysts, we traced cases of diagnosis of recurrence of the disease (31 patients). The prognostic character of the tactics of administration of patients with this type of long-term result was determined by us according to the following gradation assessment.

In particular, all 294 (98.7%) examined patients 3 months after surgery, at first glance, did not require treatment and follow-up for echinococcosis, except in cases where intervention was required for a residual cavity in the liver.

Table 6. Dynamics of changes in the outcome and prognosis of liver echinococcectomy disease

Outcome/forecast	**Dynamics of observation**					
	3 months		**6 months**		**12 months**	
	А.ч.	**%**	**А.ч.**	**%**	**А.ч.**	**%**
Absence of recurrence and residual cyst	294	98,7	239	80,2	236	79,2
Formation of a small residual cyst	-	-	52	17,4	22	7,4
Relapse of the disease	-	-	-	-	31	10,4
A course of repeated antiparasitic chemotherapy is required	-	-	52	17,4	35	11,7
A repeat operation is required	-	-	-	-	18	6,0
Died during this period	1	0,3	3	1,0	2	0,7
TOTAL PATIENTS	294	98,7	291	97,7	289	97,0

6 months after surgery, only in 80.2% of cases (239 patients), there was no need for treatment and patient monitoring. All 52 (17.4%) patients with the presence of small residual cysts required a course of repeated antiparasitic chemotherapy. This tactic corresponded to the previous criterion for evaluating long-term treatment results.

At the same time, 12 months after surgery, only 11.7% of cases (35 patients) required repeated antiparasitic chemotherapy, and 18 (6.0%) patients required repeated surgical operation echinococcectomy.

The assessment of the quality of life was carried out by means of a questionnaire according to the standard scheme. In the working capacity category, patients engaged in their full-time work 3 months after surgery were 39.6%. In subsequent follow-up periods, this indicator increased, reaching 44.0% in the 6-month follow–up period, and 44.6% in the 12-month period. In other words, the changes in the working capacity of patients in the period of 6-12 months after surgery did not change significantly.

There was a steady increase in the indicator reflecting the patient's ability to work or farm for a limited time. Here, the increase in the period from 3 to 6 months was 8.1%, and up to 12 months - only 3%. Against this background, the number of patients who did not work for health reasons decreased from 24.2% 3 months after surgery to 6.4% 12 months later.

The vital activity of the patients changed. There was an increase in the number of patients who could fully care for themselves on their own from 64.8% 3 months after surgery to 79.2% after 1 year. In the dynamics of patient monitoring, there was a decrease in the number of cases (2.1 times) when patients needed the help of outsiders. Regarding patients who could not do without outside help, it can be noted that their number was stable, which varied between 1.3% and 4.0%.

The perception of one's own health at a good level 3 months after surgery was noted in 188 (63.1%) patients. At the same time, 55 (18.5%) patients experienced physical discomfort at this time, and 51 (17.1%) patients reported feeling unwell even 3 months after surgery.

Over the next 3 months, the number of patients with good health decreased by 5.4%, due to a slight increase in patients who experienced physical discomfort (by 0.3%) and patients whose well-being they assessed as poor (by 4.0%).

As a result of timely medical measures taken over the next 6 months, the indicator reflecting the perception of the patient's own health has changed in a positive direction. The number of patients who assessed their well-being as good increased both compared to the 3-month follow-up period and the 6-month follow-up period (by 18.8% and 24.2%, respectively). During this period, there was a decrease in the number of patients who experienced physical discomfort (by 9.8% compared to the 3-month and 10.4% compared to the 6-month follow-up periods, respectively). The number of patients with poor health also decreased (2.6 times compared to the 3-month follow-up period and 3.1 times compared to the 6-month follow-up period).

A large role in the questionnaire was assigned to the assessment of those around the patient. It should be noted here that as the duration of the disease increased, there was a direct correlation in increasing the category of negative attitude (r=0.768) or support only in case of emergency (r=0.812), which inevitably led to a decrease in the quality of life of patients.

Thus, given the large diagnostic arsenal available today in the detection of liver echinococcosis, the results of treatment, both immediate and long-term, according to our data, are still not comforting. Even with the use of modern treatment methods that fully reflect the conditions of approved standards and regulations, proven surgical techniques during surgery, unfortunately, we cannot always get positive results. Postoperative complications of both local and general nature are still at a high level, which undoubtedly leads to an increase in the number of disabilities and deaths among patients with liver echinococcosis.

Conclusions.

1. Given the large diagnostic arsenal available today in the detection of liver echinococcosis, the results of treatment, both immediate and long-term, according to our data, are still not comforting.
2. Even with the use of modern treatment methods that fully reflect the conditions of approved standards and regulations, proven surgical techniques during surgery, unfortunately, we cannot always get positive results.
3. We have proven that negative treatment results, both in the immediate and long-term period after liver echinococcectomy, are often associated with the lack of a way to assess immunological changes
4. The modern view of the immunological reactions of the body in liver echinococcosis focuses on the use of diagnostic tests that reflect only the level of a specific reaction of the body. The issues related to the immunological reactions of the body in various variants of liver echinococcosis remain debatable, and therefore open.

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