NATURALISTA CAMPANO
ISSN: 1827-7160
Volume 28 Issue 1, 2024

Methods for Prediction and Prevention of Purular-Septic Complications of Liver Echinococcosis

Khamdamov Bakhtiyor Zarifovich[1], Safarov Sunnat Sattorovich[2]

[1,2]Bukhara State Medical Institute
Email: [1]dr.hamdamov@mail.ru
https://orcid.org/0000-0003-3569-6688
Email: [2]Sunnat_safarovv@mail.ru
https://orcid.org/0009-0009-6677-3587

Abstract. The use of developed methods for predicting and preventing purulent-septic complications of hydatid echinococcosis of the liver, based on identifying the degree of immunological suppression and the use of targeted methods for its correction, made it possible to significantly improve the results of treatment in the long term by 2.1 times and improve the quality of life of patients with the achievement of good results by by the end of the study up to 99.7%.

Keywords: prediction, prevention, liver echinococcosis, immunological suppression

Relevance. Echinococcosis of the liver is a severe parasitic disease caused by a tapeworm belonging to the genus Echinococcus (E. Granulosus). The disease is most common in regions where animal husbandry is popular. The Central Asian region is located in one of the zones characteristic of the endemic pathology of echinococcosis of the liver. However, in recent years, information on the spread of this disease has been published more and more often in regions, in particular in Europe, where previously echinococcosis of the liver was considered sporadic (1,3,5,7,9,11,30). The incidence of echinococcosis of internal organs, due to the peculiarities of pathomorphological manifestations of the disease, in the form of the organization of specific cysts prone to dissemination, is considered very costly for the social sphere. Given that this disease most often affects people of working age, the pathology is reflected in the increase in the number of disabilities, and in the absence of treatment – in the increase in mortality (2,4,6,8,10,12,31). According to the World Health Organization, the diagnosis and detection of the hydatidous form of liver echinococcosis should be considered an advanced form of the disease. However, along with this, in half of the cases of morbidity, due to the erasure of the clinical picture, the development of complications of the disease is more dangerous, in particular, purulent–septic (13,15,17,19,32). The spectrum of the disease depends on the acquired deviation of Th1-associated immunity, and spontaneous secretion of IL-10 by peripheral mononuclear blood cells has been identified as an immunological sign patients with progressive forms of liver echinococcosis involved in maintaining tolerance and persistence of the parasite (14,16,18,20). The reactivity of peripheral blood cells to ribbon parasite antigens persists for many years in patients after complete resection of parasitic lesions, which suggests that the residual tissues of the parasite will continue to stimulate cellular reactions (21,23,25,27,29). However, all of the above is only an assumption based on the results of a study of the pathogenesis of other parasitic diseases. At the same time, the disclosure of the possibility of stimulating the immunological response of the body to the invasion of the echinococcal parasite would, in our opinion, allow us to develop methods for predicting and preventing severe complicated forms of the disease, and, accordingly, improve the results of treatment of patients with hydatidous echinococcosis of the liver.
In this regard, the aim of our study was to improve the results of treatment of patients with liver echinococcosis by determining the role and place of immunopathogenetic aspects in the prediction and prevention of purulent septic complications in this disease.

1. Material and Methods

The work consists of a clinical and experimental part. The clinical material consists of 594 patients with hydatidous echinococcosis of the liver (control – 298 patients and main – 296 patients) who were treated and examined at the Bukhara regional Multidisciplinary clinic from 2010 to 2023. Experimental studies were

conducted on beardless rabbits that were in vivarium conditions of the central research laboratory of the Bukhara State Medical Institute. A total of 45 animals weighing 1.5-2.0 kilograms, of both sexes, without external signs of the disease were used.
Patients meeting the following criteria were included in the study: Written consent of the patient to conduct the study, the patient's age must be at least 18 years old and not older than 75 years old, patients who met the following criteria were excluded from the study: the presence of a severe concomitant (somatic) disease in the acute phase of its development, the patient's age is under 18 years old or over 75 years old.
The separation of patients by sex and age revealed the predominance of the female sex (60.6%) between the ages of 51 and 60 years. Patients with primary hydatidous echinococcosis of the liver prevailed (72.1%). In second place were patients with recurrent hydatidous echinococcosis of the liver, among whom patients with multiple forms prevailed, exceeding solitary formations by 1.5 times. In 71 cases (12.0%), residual forms of hydatidous echinococcosis of the liver were diagnosed, which occurred in almost the same proportion as solitary and multiple. The difference between them was 1.2 times in favor of multiple parasitic liver cysts. In 36.1% of cases, the parasite in the hydatidous cyst of the liver was alive, and in 27.6% of cases it was dead. Complicated forms of the disease (suppuration of the cyst; suppuration of hydatidous echinococcosis of the liver, with a breakthrough into the intrahepatic bile ducts, with the development of cholangitis and mechanical jaundice; suppuration of a parasitic cyst with a breakthrough into the pleural cavity, followed by the development of pleural empyema; suppuration of a parasitic cyst of the liver, with a breakthrough into the pleural cavity and further into the bronchial tree, with the development of purulent endobronchitis; perforation of the echinococcal cyst of the liver into the free abdominal cavity with the development of peritonitis) was in 36.3% of cases.

To achieve the desired goal, we divided the total array of experimental studies into 3 series of experiments: The control series consisted of 10 intact animals that were not exposed to any external influences other than blood sampling. The main series consisted of 10 animals and was divided by us into 3 components, which determined the chronology of modeling the pathological process. As needed (death, incorrect manipulation, lack of reproducibility of the model, etc.). the series was supplemented with new animals. The main series of animals in the dissertation work was designated by three values as the main one-1, the main one-2 and the main one-3, which was carried out conditionally in connection with the transformation of the pathological process in the dynamics of its development. The process of modeling pathological processes was composed of several chronologically running stages. At the first stage, the main goal was to simulate hydatidous echinococcosis of the liver. To do this, the animals were euthanized using ether anesthesia. An oblique incision was made in the right hypochondrium with a length of up to 5 cm. Exposing the liver of the animal, a position was created that allows the organ to be pulled back as much as possible in the distal direction. The diaphragmatic surface of the liver was visually assessed, preserving all ligamentous elements of the organ. Organ tissue with a length of up to 1.0 cm and a depth of up to 0.5 cm was excised by electrocoagulation on its diaphragmatic surface with the formation of a lunate-shaped defect measuring 0.5 x 0.5 cm. After removing the liver flap, the wound surface was carefully coagulated, achieving complete hemostasis and cholestasis. A daughter bladder of an echinococcal cyst was lowered into the formed cavity. Next, fixing 2-4 sutures were applied with atraumatic threads between the edges of the liver wound and the diaphragm. The final stage of modeling the pathological process was the drainage of the formed liver bed with a microirrigator with the removal and fixation of its free end under the skin of the animal. Starting from 20 days after modeling the pathological process, for the next 80 days, a study was conducted with animals of this series, designated by us as the main one-1. After another 1 month of the development of the pathological process, a 30% suspension of the animal's autokal at a dose of 1 ml / kg of the animal was introduced into the previously installed microirrigator. Over the next 14 days, the clinical picture of the development of a purulent-inflammatory complication of hydatidous echinococcosis of the liver was observed. All these animals were transformed into the main-2 series. Studies in animals of the main-1 series were conducted on the 20th, 60th, 80th days of reproduction of the pathological process, and in animals of the main-2 series – on the 3rd, 7th and 14th days of the disease development. The comparative series included at least 10 rabbits and consisted of two parts of the same animals with the transformation of the pathological process. In this series, all stages of reproduction of hydatidous echinococcosis of the liver (comparative-1 series) and purulent-inflammatory process (comparative-2 series) were performed, but without implantation of the parasitic cyst itself.
The work uses clinical, immunological, biochemical, morphological, ultrasound, X-ray, analytical and static research methods performed in the Central Research Laboratory of the Bukhara State Medical Institute. Ibn Sina.

All the research methods were divided into standard and special (immunological) ones. A skin allergy test using the Katsoni method, a latex agglutination reaction, indirect hemaglutination, an enzyme immunoassay method, general blood tests, biochemical blood tests (total protein and its fractions – albumins and globulins with their division into subfractions; total bilirubin and its direct fraction; activity of AsAt and AlAt, thymol test, urea and creatinine), markers of inflammation (C-reactive protein and procalcitonin, leukocyte intoxication index), ultrasound diagnostics, multispiral computed tomography, magnetic resonance imaging.
In patients of the control group, special or immunological research methods included the determination of lymphocytes in peripheral blood, the content of T-lymphocytes and their subpopulation composition of T-helper/inducers (CD4+ T-lymphocytes) T-suppressors/killers (CD8+ T-lymphocytes), serum immunoglobulins IgA, IgM, IgG, circulating immune complexes. In patients of the main group and in experimental animals, the study of the immunological status of the organism was carried out in a more extended version. In patients of the main group, the same method of blood sampling was carried out on time at the first visit of patients to the clinic and then on the 14th, 30th, 60th day, as well as after 6 months and 1 year, which was associated with the assessment of long-term results of the treatment. In order to compare the prognostic effectiveness and sensitivity of the testing methods developed by us, 10 volunteers from among healthy individuals recognized as such by the medical commission were voluntarily involved in the research. The scope of the studies included: quantitative determination of cytokine secretion in pg/ml (IL-8, IL-9, IL-10, IFN-γ, IL-12 and TNF-α) and chemokines in pg/ml (CCL13, CCL17, CCL18, CCL20, CCL22); quantitative determination of indicators cellular immunity (CD4+ CD28+, CD8+ CD28+, CD4+ CD25+); determination of the concentration of immunoglobulins IgG, IgG4, T-IgE and S-IgE.

To assess the immediate results of treatment of patients with hydatidous echinococcosis of the liver, both in the control and in the main groups, we used an improved grading scale consisting of criteria for the presence and nature of surgery, residual cavity in the liver, general and local postoperative complications. To study the long-term results of treatment and quality of life of patients with hydatidous echinococcosis of the liver, both in the control and in the main groups, we used an improved gradation scale consisting of criteria for the presence and nature of a residual cavity in the liver, the outcome of the disease, prognosis, current performance, vital activity, perception of one's own health, assessment of the quality of one's life and family relationships.

2. Analysis of The Results and Their Discussion.

An analysis of the results of the use of traditional methods of treatment of 298 patients with hydatidous echinococcosis of the liver showed that primary forms of liver echinococcosis prevailed (75.8%) by the nature of the disease, to a lesser extent - with recurrent (15.4%) and with residual (8.7%). Solitary forms of liver echinococcosis prevailed (61.1%) over multiple forms (38.9%). In 49% of cases, a complication of liver echinococcosis was noted in the form of cyst suppuration (53.4%), cyst suppuration with a breakthrough into the intrahepatic bile ducts with the development of cholangitis and jaundice (37%), suppuration of an echinococcal cyst with a breakthrough into the pleural cavity and the development of pleural empyema (6.2%), cyst breakthrough into the free abdominal cavity with the development of peritonitis (2.1%), suppuration of the cyst with a breakthrough into the bronchial tree (1.4%). Open echinococcectomy was performed in 80.9% of cases. The method of eliminating the residual liver cavity by capitation with external drainage prevailed (62.2%). In the postoperative period, the following complications were noted: suppuration of the wound (8.4%), exudative pleurisy (7.7%), acute bronchopneumonia (5.7%), empyema of the pleura (5%), development of ligature fistula of the wound (4.7%), formation of bile fistulas (4.4%), abscess of the residual liver cavity (3.7%), wound infiltration (3.4%), sepsis (3.4%), seroma formation (3%), acute urinary retention (2.3%), marginal necrosis of the wound and eventration of internal organs (2%), osteomyelitis of the rib (1.7%), peritonitis (1.7%), liver failure (1.7%), subcutaneous hematoma (1.3%), myocardial infarction (1%), intra-abdominal bleeding (0.7%), acute cerebrovascular accident (0.7%), acute renal failure (0.7%).
3-12 months after surgery, complete reduction of the residual liver cavity was noted in 78.5%-95.6% of patients. During this period, 6 more patients (2%) died. Recurrence of the disease was diagnosed in 10.4% of cases, and the presence of residual cysts in 7.4% of cases.

When assessing the structure of postoperative complications, we revealed a predominance of the frequency of negative consequences, which are inflammatory and disseminated in nature. A certain role in this is played by a change in the overall reaction of the body. At the same time, based on the materials of the literature reflecting the violation of the immunological system of the body in the pathogenesis of echinococcosis associated with the

sensitization of the body and the organization of the rejection reaction, it can be assumed that there is a certain gap in research in this field of medicine.

We have proved 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.
The study of the features of clinical and laboratory, biochemical and primary immunological manifestations, changes in inflammatory markers in patients with liver echinococcosis showed that the average number of CD8+ T killer cells in all patients of the control group was 621.92±231.16 cells per 1 ml of blood. At the same time, the maximum number was noted among patients with a recurrent form of the disease (713.27±186.82 cells in 1 µl of blood), and the minimum was in patients with primary echinococcosis of the liver (516.84±103.17 cells in 1 µl of blood). The number of CD8+ T killer cells in a comparative analysis in patients with live echinococcosis averaged 522.32±116.52 cells in 1 ml of blood, with dead - 628.97±219.65 cells in 1 ml of blood, and with complicated – 714.48±276.33 cells in 1 ml of blood. At the same time, if in patients with dead echinococcus, the number of CD8+ T killer cells increased by 106.65 ±45.53 cells per 1 ml of blood compared with patients with a living parasite, then in patients with a complicated form of the disease, the increase was already by 192.16±36.14 cells per 1 ml of blood. The smallest difference in the increase in the number of CD8+ T killer cells was between the dead and the complicated parasite (85.51±25.33 cells per 1 µl of blood). The comparison of the increase in the number of CD8+ T killer cells in patients with complicated forms of liver echinococcosis compared with uncomplicated ones was 2.25 times ($p<0.05$). A comparison of the number of CD8+ T killer cells between patients with a living and dead parasite showed that the maximum level of difference was detected in its residual forms (166.38±41.74 cells in 1 µl of blood). At the same time, in patients with complicated forms of liver echinococcosis, when compared with the total number of cases with a living and dead parasite, the maximum increase in the number of cells was noted in patients with a recurrent form of the disease (623.96±211.53 cells per 1 ml of blood).

These data may directly indicate the development of the activity of the role of T-killers as an inflammatory or other complication of liver echinococcosis develops. At the same time, the level of T-helper cells changes in the opposite direction, combining the nature of the lesion of clinical cases with a living and dead parasite, but without complications, especially of an inflammatory nature. The maximum amount of IgA in the blood was detected by us among patients with complicated forms of liver echinococcosis (2.94 times; $p<0.05$). At the same time, the peak of this value was in patients with recurrent complicated form of liver echinococcosis (an increase of 3.14 times; $p<0.05$). The average amount of IgM content was almost identical to the previous immunoglobulin. Despite the relatively low average significance of IgM than IgA, an overall comparative increase was noted in patients with recurrent liver echinococcosis. At the same time, the high IgM titer in patients with recurrent forms of hepatic echinococcosis (3.23 times; $p<0.05$) was due to the duration and repeated development of the disease. The difference in IgM content in patients with liver echinococcosis increased depending on the vital activity of the parasite. In particular, in patients with a dead parasite, the IgM titer in the blood increased by 0.28±0.1 g/l ($p<0.05$).

The average IgG level in patients with liver echinococcosis was 13.01±2.35 g/l. At the same time, the maximum peak titer of this immunoglobulin was in patients with recurrent forms of the disease (15.71±3.11 g/l), and the minimum was in patients with primary echinococcosis of the liver (9.15±1.08 g/l; $p<0.05$). Depending on the form of the disease, an average high IgG titer in the blood can be noted in patients with complicated forms of liver echinococcosis (14.6±3.52 g/l; $p<0.05$) and with a live parasite without complication of the pathological process (13.41±2.72 g/l; $p<0.05$). In the case of a dead parasite, the IgG titer level was at an intermediate level and averaged 11.03±3.12 g/l ($p<0.05$). The study of circulating immune complexes in the blood of patients with liver echinococcosis amounted to 117.35±39.12 optical units. On average, in patients with primary liver echinococcosis, it was 97.69±25.62 optical units, in the residual form – 119.17±27.13 optical units, and in the recurrent form – 135.19±23.43 optical units. These data confirm the cumulative nature of circulating immune complexes. An increase in the concentration of circulating immune complexes in the blood was noted in all patients with a recurrent form of the disease. At the same time, the minimum level was for patients with a living parasite, and the maximum level was for patients with a complicated form of the disease (an increase of 1.99 times). The comparative difference between patients with uncomplicated and complicated forms of the disease showed an increase in favor of complicated forms of the pathological process (an increase of 144.56±41.45 optical units; $p<0.05$). The average difference in this category was 83.96±21.76 optical units ($p<0.05$).

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 both bile formation (hepatic jaundice) and its passage (mechanical jaundice). A comparative analysis of the ratio of CD4+/CD8+ cells in the blood of patients with various forms of liver echinococcosis showed that the maximum difference (in the order of 1.37 times) was noted by us in patients with primary liver echinococcosis, while the minimum difference was in patients with recurrent (1.06 times). That is, an increase in the number of T-helpers in patients with recurrent liver echinococcosis was accompanied by the accumulation of T-killers (r=0.729). We also noted a similar pattern of changes in the studied T-lymphocytes among patients with a complicated form of the disease (by 0.84 times). An inverse correlation difference (r=-0.611) in the change in the number of T-lymphocyte subpopulations occurred in patients with live liver echinococcosis (by 1.54 times). The difference in the number of T-lymphocyte subpopulations between patients with live and dead liver echinococcosis was insignificant
We have noted an increase in sensitization in patients with recurrent complicated form of liver echinococcosis. However, if, in the case of comparing the level of IgG in the blood between patients with a living and dead parasite, it is possible to determine the difference in a decrease in IgG titer by 9.06±2.43 g/l ($p<0.05$) in patients with a dead primary parasite, then in cases with a residual and with a recurrent form of the disease, an insignificant decrease in titer was noted. This is what led to the low differentiated significance of IgG between patients with live and dead uncomplicated liver echinococcosis. In patients with primary hepatic echinococcosis, the importance of IgG growth is essential in the diagnosis of the disease.

The study of the peculiarities of changes in cellular and humoral immunity in various experimental models of liver echinococcosis showed that already on the 20th day of the study, the number of CD4+CD28+ T cells increased sharply among animals with the main series of experiments from 27.49±1.12% to 46.93±3.91% ($p<0.05$). At the same time, the cell level in the comparative series of experiments (27.55±2.32%) was more close to the control series of experiments. The same pattern was observed in the study of CD4+CD25+ T cells (growth was from 3.77±0.42% to 7.98±0.39% ($p<0.05$). On the 40th day of modeling hydatidous echinococcosis of the liver, the total number of studied T cells increased. In relation to CD8+CD28+, the leading value can be noted in animals of the control group (15.72±1.41%). As for the dynamics of changes in CD4+CD25+ T cells, we can definitely note their gradual growth between intact animals (3.95±0.35%) and rabbits of the comparison group (5.22±0.13%), and a spurt in growth in the main series of experiments (27.94±1.15%). On the 80th day of modeling of hydatidous echinococcal cyst of the liver, CD4+CD28+ T cells prevailed (55.82±5.42%). The average content of CD8+CD28+ T cells was equated to 17.21±2.64%, and CD4+CD25+ T cells - 28.11±2.32%. On the 3rd day of modeling hydatidous echinococcosis of the liver, complicated by a purulent-septic process, the T-cell populations of CD8+CD28+ increased to 17.96± 3.11%, against the background of a decrease in the remaining studied parameters. In subsequent periods, the average percentage of T cells was equated between CD8+CD28+ (18.32±2.15%) and CD4+CD25+ (24.62±1.51%). This balance was as close as possible in animals with a complicated form of the disease, whereas in animals with an uncomplicated form the digital interval was significantly higher ($p<0.05$).

When a bacterial infection was introduced in the case of reproduction of a false model with a purulent-septic complication, the correlation ratio of the studied indicators changed, and in some cases radically. For example, the inverse correlation of CD8+CD28+ and CD4+CD28+ continued to grow (R=-0.919). The indicators CD4+CD25+ and CD4+CD28+ acquire an inverse correlation and approach their maximum values (R=-0.989). This characterizes the body's immune response to the arrival of a non-specific bacterial infection. The proof of our judgment can be the value of the correlation relationship between CD4+CD25+ and CD8+CD28+ (R=0.871), which goes from a low inverse correlation to a high direct relationship. When modeling hydatidous echinococcosis of the liver without purulent-septic complications, the correlation value of all indicators acquires an absolute direct dependence. Under conditions of chronic inflammatory process, T-cells acquire an expressive character in dynamics, strengthening their immune response. The high correlation significance of cellular immunity indicators was determined by a high direct relationship between all the studied T cell populations. The maximum significance (R=0.996) was observed between CD4+CD25+ and CD4+CD28+ changes. The correlation between the dynamics of CD8+CD28+ and CD4+CD28+ was almost at the same level (R=0.992).
In the dynamics of reproduction of the experimental model of hydatidous echinococcosis of the liver, the level of total IgE increased from 77.53±13.11 IU/ml to 330.19±44.91 IU/ml ($p<0.05$). The growth of IgG in the blood during the modeling of hydatidous echinococcosis of the liver, not complicated by a purulent-septic process up to 164.92±24.17 IU/ml, was more pronounced compared with the control series of experiments (87.10±13.01

IU/ml) than in relation to the comparative series of experiments (98.15±13.68 IU/ml). A more reliable value ($p<0.001$) was noted for the intensity of such an IgG4 process in comparison with the control series of experiments (0.44±0.08 IU/ml) than in comparison with the comparative (2.23±0.12 IU/ml). Modeling of hydatidous echinococcosis of the liver led to an increase in cytokines in the blood IL-8, IL-9, IL-10 and IFN- γ. Such an increase of more than 10 times the value was noted by us: in relation to IL-9 to the control group of animals on the 40th day of modeling ($p<0.001$); in relation to IL-8, IL-9 and IL-10 on the 80th day of modeling compared with the control group of animals ($p<0.001$); and in relation to IL-9 on the 80th day of modeling to the comparison group ($p<0.001$).

A high difference in changes in the level of CCL20 (LARC) was noted by us on the 80th day of reproduction of the experimental model of hydatidous echinococcosis of the liver compared with the control group by 11.03 times ($p<0.05$). The same nature of the difference (an increase of 7.48 times) was noted by us in relation to the comparative group of experiments ($p<0.05$), although on the 40th day of reproduction of the experimental model, this difference in increase was only 5.84 times compared with the control series of experiments ($p<0.05$). A marked difference in the increase in CCL22 (MDC) was noted on the 80th day of the course of the pathological process compared with the control group of experiments. An almost identical increase in CCL13 (MCP-4) was noted by us on the 40-80-day reproduction of the experimental model of hydatidous echinococcosis of the liver, without purulent-septic complication (5.71 and 5.47 times; $p<0.05$). A stable surge in the increase of CCL18 (PARC) was noted throughout the modeling process of the pathological process from 3.42 to 3.53 times ($p<0.05$). Against this background, the low significance of the change in CCL17 (TARC) was noted, which was characterized at first by an increase followed by a regression in the activity of these chemokines. Changes in humoral immunity in animals with an experimental model of hydatidous echinococcosis of the liver complicated by a purulent-septic process were expressed by a sharp jump in TNF-α production in a total value of 86.51 times ($p<0.001$). It should be noted the most significant differences ($p<0.01$) in such indicators of humoral immunity as S-IgE (9.94 times), chemokines CCL20 (LARC) (6.52 times) and cytokine IL-10 (5.77 times), emphasizing their importance in the purulent-septic process. Significant differences in the production of humoral immunity indicators corresponding to the minimum t-value we accepted, that is, $p<0.05$, subject to the addition of a purulent-septic process, were noted with respect to IgG4 (4.01 times), IL-12 (3.86 times), IFN-γ (3.68 times), IL-8 (3.6 times), IL-9 (3 times), IgG (2.65 times), CCL22 (2.54 times) and CCL13 (2.11 times).

Thus, an absolute and significant increase in CD4+CD28+ was noted during all modeling periods of hydatidous echinococcosis of the liver ($p<0.05$). An increase in the number of CD4+CD25+ was noted in the late stages of modeling the pathological process. At the same time, against this background, there was a decrease in the number of CD8+CD28+, which indicates differentiated changes in the peripheral blood mononuclear cells themselves. The pronounced difference in the percentage level of CD4+CD25+ and CD8+ CD28+ T cells, which occurred in animals with hydatidous echinococcosis of the liver in the case of bacterial infection on the 7th-14th day of the disease, progressively decreases. This, in turn, indicates the dependence of the sensitivity of cellular immune dependence not only on parasitic infection, but also bacterial. Modeling of hydatidous echinococcosis of the liver without purulent-septic complications leads to a sharp jump in the studied cytokines with the exception of IL-12 and TNF-α, which progressively decreased despite the development of the severity of the pathological condition. The changes occurring in the composition of chemokines are not identical in all cases with the development of hydatidous echinococcosis of the liver, complicated by a purulent-septic process, however, in all cases there is a suppressed increase in the number of CCL20 (LARC), CCL13 (MCP-4) and CCL22 (MDC). Reproduction of the experimental model of hydatidous echinococcosis of the liver leads to a differentiated expression of lymphocyte subpopulations, converting the body's protective reaction into a kind of immune response, which was characterized by the activity of T cells to organize the process and form a protective layer. However, this response of the body under the influence of a secondary, non-specific bacterial infection changed its nature of the immune trace, which can be traced in the following analysis. The aggravation of the pathological process in the form of the addition of a purulent-septic complication of hydatidous echinococcosis of the liver led to the development of both parallel and reverse processes in the expression of T-lymphocytes, enhancing the immunological response against the background of high sensitization of the body. This, in turn, leading to a restructuring of the immunological reaction of the macroorganism, contributes to the emergence of a load on the entire studied cell population of T-lymphocytes.

Further, the work was devoted to the clinical and experimental substantiation of the importance of cellular and humoral immunity indicators in predicting purulent-septic complications of liver echinococcosis. For this

purpose, patterns in the formation of the cellular-humoral immunological response of the body in hydatidous echinococcosis of the liver are revealed, clinical and experimental substantiation of the peculiarities of changes in the cellular-humoral immunological response of the body in hydatidous echinococcosis of the liver is given. This ultimately allows us to develop methods for predicting purulent-septic complications of hydatidous echinococcosis of the liver. Studies have shown that animals with an experimental model of hydatidous echinococcosis of the liver have a progressive IgG4 response growth. This body response was supported by a Th2-type cytokine response. With the addition of purulent-septic complications, the growth of this immunoglobulin doubles. This is due to the corresponding response of the body to the effect of antigens of the membrane of the daughter cell of echinococcosis. This process is based on the presence of stimulating antigens from a component part of the membrane of daughter larvae of Echinococcus. Based on the conducted multifactorial analysis, we proved that in conditions of progression of hydatidous echinococcosis of the liver, the dominance of T cells of the immune response, in particular, the Th2 response of the body, plays a leading role. In patients with a regressive form of liver echinococcosis, the dominance of Th1 immune response T cells was noted. At the same time, the progression of the disease, the dissemination of echinococcosis and the development of residual forms are accompanied by a Th2 response of the body. According to the results of experimental studies, in the dynamics of the development of hydatidous echinococcosis of the liver, there was an increase in CD4+CD28+ and CD4+CD25+. Since CD25+ is induced on both Th1 and Th2 helper cells, and is also present in other effector cell populations, such as activated B cells, dendritic cells, and monocytes, detailed studies should include high or low levels of CD25+ expression along with intracellular cytokine profiling to confirm these results. We have revealed that the production of cytokines IL-8, IL-9, IL-10, IFN-γ in Th2 type occurs as a response of the body. However, in the case of purulent-septic complications, there was a significant increase in the above cytokines in the order of 2 to 5 times. This growth occurred due to stimulation of peripheral mononuclear blood cells by parasitic antigens. In other words, the dynamics of the process led to increased sensitivity to these cytokines, especially to IFN-γ, the level of which reached 5 fold increases. In the dynamics of the development of hydatidous echinococcosis of the liver, the induction of activators of regulated chemokines CCL13 (MCP-4), CCL18 (PARC), CCL20 (LARC) and CCL22 (MDC) occurs against the background of low activation of CCL17 (TARC). Chemokines, apparently, in this case contributed to the development of a response of Th2 cells than Th1-cytokine-mediated granulomatous inflammation, causing their expansion. Chemokine CCL17 (TARC) type Th2 mediates chemotactic action on macrophages, monocytes, eosinophils and basophilic granulocytes. The level of CCL17 (TARC) usually increases with inflammatory reactions of the Th1 type, especially during the acute phases, however, under conditions of attachment of the purulent-septic process, its value was neutral and almost could not be stimulated, which once again confirms the low importance of Th1 cells.

Thus, a differentiated assessment of the level of changes in the studied parameters of cellular-humoral immunity in patients with liver echinococcosis once again confirmed our preliminary experimental studies and indicates their acceptability as one of the criteria for predicting complications of liver echinococcosis, including purulent-septic ones. Comparing the obtained clinical and experimental data, we identified characteristic curves of the dynamics of changes in the studied parameters, which reflected the reaction of the humoral response to cellular expansion as a result of invasion into the liver of the hydatidous cyst of echinococcus. By conducting a multifactorial correlation analysis of indicators of cellular and humoral immunity and variants of the course of hydatidous echinococcosis of the liver, we have developed criteria for predicting the development of purulent-septic complications of hydatidous echinococcosis of the liver. The pathogenesis of such disorders is based on the degree of specific immunological suppression, which leads not only to the development of hydatidous echinococcosis of the liver, but also its purulent-septic complications.

Having compared all the obtained immunological data, including the characteristics of their correlation and the volume of organization of arithmetic cloud phases, we have developed a method for predicting purulent-septic complications based on the degree of immunological suppressiveness. At the same time, the levels of immunological suppressiveness had a gradation value in the form of I-III degrees (compensated, subcompensated and decompensated). The developed scale of immunological suppressiveness in liver echinococcosis has a digital level for each value, which was indicated by us in points and varied from 0 to 100 points depending on the degree of lesion. Further, work was carried out on the clinical and immunological justification of the choice of methods for the prevention of purulent-septic complications of liver echinococcosis. A compensated degree of immunological suppression was diagnosed in 104 patients with an uncomplicated form of hydatidous echinococcosis of the liver. At the same time, in 33.7% of cases (35 patients) these were patients with CE-4, in 27.9% of cases (29 patients) – patients with CL, in 26.9% of cases (28

patients) – patients with CE-3, in 10.6% of cases (11 patients) – patients with CE-1 and 1% (1 patient) – with CE-2. A subcompensated degree of immunological suppression in 50% of cases (12 patients) was characteristic of hydatidous echinococcosis of the liver with ultrasound signs of CE-1, in 37.5% of cases (9 patients) – for patients with CE-2, in 8.3% of cases (2 patients) - for patients with CL, and in 4.2% of cases (1 patient) – for patients with CE-3. The decompensated degree of immunological suppressiveness was diagnosed by us mainly (93.3%) among patients with ultrasound signs of hydatidous echinococcosis of the liver CE-2. Only 1 patient (6.7%) with ultrasound signs of hydatidous echinococcosis of the liver CE-1 showed a decompensated degree of immunological suppression.

Thus, a compensated degree of immunological suppressiveness was characteristic for patients with developing and dead hydatidous echinococcosis of the liver, a subcompensated degree of immunological suppressiveness - for patients with a live active parasite of hydatidous echinococcal cyst of the liver, a decompensated degree of immunological suppressiveness - for patients with a live active multicameral parasite of hydatidous echinococcal cyst of the liver. We did not identify normal and compensated values of immunological suppressiveness among patients with a complicated form of hydatidous echinococcosis of the liver. In most cases (58.94%), we detected decompensated and to a lesser extent (41.06%) – subcompensated degrees of immunological suppressiveness.

Summing up the results of comparative analyses of changes in the degree of immunological suppression and clinical and laboratory signs of various forms of hydatidous echinococcosis of the liver, we can note that in this disease, the presence of a certain form of purulent-septic complication and especially its manifestations, in the form of signs of a systemic inflammatory reaction syndrome, cannot be taken as the basis for an objective assessment of the patient's condition. This statement, in our opinion, is due to early immune suppression, which led to the development of hydatidous echinococcosis of the liver, since its development, and even more so its manifestation, as shown by our experimental data, requires restraint of the immune response system, which proceeded according to the Th2 cell type. And even with the development of cytokinemia, the clinical picture of the purulent-inflammatory process does not reflect the whole essence of the immunological manifestations of the disease.
Only the transition to the Th1 cellular type of the body's response leads to a transition to a competent type of immunological response, which contributed to the death of the parasite and its daughter cysts, followed by the development of calcification of the destruction site. It is the translation of the body's immunological response to the Th1 cellular type of response that should be the priority for correcting the disorders that occur. Accordingly, the use of preventive measures to correct immunological suppressiveness will contribute to improving the results of treatment of patients with hydatidous form of liver echinococcosis. Through experimental studies, we have proved that immunoglobulins, in particular G, play a key role in the body's immunological response, which, when exposed to echinococcosis membrane antigens, trigger the body's response according to a certain type of cellular-humoral mechanism.
At the same time, in the presence of purulent-septic complications, in conditions where the focus of destruction persists, all measures aimed at detoxification and correction of identified immune disorders can be considered nullified due to their low effectiveness.

In this regard, in the main group of patients, the algorithm of tactics of therapeutic and diagnostic measures was based on the first stage in the differentiation of patients divided into subgroups with a complicated course of hydatidous echinococcosis of the liver and without complications. In cases where the patient has a complicated form of hydatidous echinococcosis of the liver, measures were taken aimed at differentiating its type and nature of damage to organs and body systems with full verification of the final diagnosis. The main focus was on reducing the duration of the preoperative period and performing surgical intervention as soon as possible after the patient's preparation. Immediately in the postoperative period, the degree of immunological suppression was assessed, which determined our further tactics of therapeutic measures. With a compensated degree of immunological suppressiveness, no special correction of the immune system was required. Conventional therapy was carried out, including antibacterial, detoxification and restorative treatment. Along with this, targeted antiparasitic chemotherapy was started. In case of subcompensated immunological suppressiveness in the early postoperative period, measures were also carried out, including antibacterial, detoxification and restorative therapy. However, along with this, correction of immunological suppressiveness was required by conducting targeted immunomodulation (thymomimetics, antibody formation and phagocytosis stimulants). When a compensated degree of immunological suppressiveness was achieved, targeted antiparasitic chemotherapy was started. With a decompensated degree of immunological suppression, second-level

detoxification therapy was performed in the early postoperative period, which included plasmapheresis, hemosorption, and infusion of detoxifying solutions. Metabolic and antioxidant drugs were also prescribed. In order to correct immunological suppressiveness, in the early postoperative period, substitution immunotherapy (immunoglobulins, interferon alpha, thymomimetics, Roncoleukin) was started.

This approach to therapeutic measures was carried out until the level of subcompensated or compensated degree of immunological suppressiveness was reached, against which targeted antiparasitic chemotherapy was started. In patients with an uncomplicated form of hydatidous echinococcosis of the liver, the stage of development of a parasitic cyst was diagnosed at the first stage in comparison with the degree of immunological suppression of the body. All measures, including immunomodulation and substitution immunotherapy, were carried out according to the same scheme as in the case of a complicated form of hydatidous echinococcosis of the liver. However, unlike the complicated variant of the course of the disease, with an uncomplicated one, surgical intervention was performed only when the level of compensated immunological suppressiveness was reached, which is achieved by carrying out the above-described therapeutic and diagnostic algorithm.
After the targeted antiparasitic chemotherapy, a repeated diagnosis of the degree of immunological suppressiveness was carried out for 30 days.

An analysis of the effectiveness of the developed clinical and immunological methods for predicting and preventing purulent-septic complications of liver echinococcosis showed that the main share of surgical operations was closed ideal echinococcectomy, which was performed 2.1 times more often than in patients of the control group. In the main group of patients, complete elimination of the residual cavity in the liver and complete reduction of the cavity were recorded 1.2 times more often after surgery in 22.2% of patients. The targeted effect on the correction of the immunological reaction of the body allowed in the main group of patients to reduce by 1.7 times the frequency of preservation of the residual liver cavity after drainage removal, and by 6.8 times purulent-septic complications. Most of all, a decrease in the incidence of osteomyelitis of the rib (4.5 times) and the formation of abscesses of residual liver cavities (3.3 times) was achieved. The formation of intestinal and biliary fistulas was reduced 2.9 times more in the main group of patients than in the control group (from 4.4% to 1.5%). The incidence of internal organ infection was reduced by 1.8 times, that is, from 2% to 1.1%. Along with this, in the main group of patients, we avoided the development of such formidable postoperative complications as peritonitis and intra-abdominal bleeding, which were noted in the control group of patients in 2.4% of cases.

Thus, as can be seen from this comparative analysis, the use of the method we developed for predicting and preventing purulent-septic complications made it possible, after correcting the immunological suppressiveness of the body, to improve regenerative properties, affecting the entire tissue repair system, to avoid the development of complex, not infrequently fatal postoperative complications. General postoperative complications in patients of the main group were noted in 3.8% of cases. The achievement of the level without a general postoperative complication among the patients of the main group was achieved 1.3 times more.
In general, the use of the therapeutic and diagnostic algorithms developed by us allowed, in the main group of patients, compared with the control group, to increase the number of good treatment results from 30.9% to 35.1%, satisfactory - from 53.4% to 56.4% and reduce unsatisfactory treatment results from 14.8% to 8.1%, and mortality – from 1.0% to 0.3%.
Thus, the use of the methods developed by us for predicting and preventing purulent-septic complications allowed their overall frequency to decrease 2.8 times in relation to the control group of patients, that is, from 28.2% to 10.1%, which indicates the high effectiveness of the measures developed by us. It should also be noted the change in the structure of postoperative complications, in which a decrease in purulent-septic is clearly visible.
Already at 3 months of follow-up, complete obliteration of the residual cavity occurred in 86.8% of patients. The effectiveness of the therapeutic and diagnostic algorithm developed by us was proved once again by the low incidence of residual echinococcosis and the absence of recurrence of the disease throughout the long-term follow-up period.

3. Conclusion:

1. Despite the use of modern methods of diagnosis and treatment of hydatidous echinococcosis of the liver, a retrospective analysis of the immediate results of treatment of patients in the control group showed, unfortunately, high values of unsatisfactory results and mortality (14.8% and 1%, respectively). In the long-term

period, 10.4% of patients had a recurrence of the disease, and 7.4% had residual cysts. In the separated period after surgery, 6 more patients died as a result of the development of postoperative complications.
2. Analysis of changes in clinical and laboratory, biochemical and primary immunological blood parameters in patients with liver echinococcosis allows us to conclude about the activation of homeostatic processes, not the least of which is assigned to primary immunological parameters. However, these data cannot reflect the full extent of the mechanism of transformation of the immunological response, and therefore they fall out of the field of view of clinicians in everyday clinical practice. A targeted study of the correlation of T-lymphocytes, cytokines and chemokines is required, which together can reflect the stages of complex immunological reactions of the body in response to both the invasion of the parasite and the development of its purulent-septic complications.
3. The correlation of indicators of cellular and humoral immunity allows us to identify 3 phases of the development of immunological suppressiveness in hydatidous echinococcosis of the liver (non-competent immune response of the body). The first phase is characterized (compensated) by significant changes in cytokines IFN-γ and IL-9, which serve as markers of an immunosuppressive state, creating conditions for invasion and growth of the parasite in the liver. The second phase (subcompensated) is characterized by a decrease in the correlation values of IL-8 and IL-10 cytokines, as well as T-cell activity, which indicates the progression of the disease. The third phase (decompensated) is characterized by a predominance of increased activity of T cells, which enhance the production of cytokines due to lymphocytes and other cells that play a key role in the purulent-septic process.
4. The translation of the body's immunological response to the Th1 cellular type of response should be a priority for correcting the occurring disorders. At the same time, the key role in the development of this reaction is played by the degree of production of immunoglobulin G, which, when exposed to echinococcosis membrane antigens, trigger the body's response according to a certain type of cellular-humoral mechanism. At the same time, in the presence of purulent-septic complications, in conditions where the focus of destruction persists, all measures aimed at detoxification and correction of identified immune disorders can be considered nullified due to their low effectiveness.
5. The application of the developed clinical and immunological methods for predicting and preventing purulent-septic complications of liver echinococcosis has reduced their incidence from 28.2% to 10.1%. Compared with the control group of patients, an increase in the number of patients with good and satisfactory treatment results was achieved by 7.2% overall, and the number of patients with unsatisfactory treatment results and mortality was reduced by 1.8 and 3 times, respectively.
7. The application of the developed methods for predicting and preventing purulent-septic complications of hydatidous echinococcosis of the liver, based on the identification of the degree of immunological suppression and the use of targeted methods for its correction, significantly improved the results of treatment in the long-term period by 2.1 times and improved the quality of life of patients with good results by the end of the study to 99.7%.

4. References

1. Ахмедов, Р. М., Хамдамов, Б. З., Иноятов, Х. Х., Тагаев, Ф. Х., Хамдамов, И. Б., & Хамдамов, А. Б. (2016). Эффективность применения повидон-йода при обработке остаточной полости после эхинококкэктомии печени. *Наука молодых–Eruditio Juvenium*, (2), 98-104.
2. Басарукин, М. А. Клинический случай гидатидного эхинококкоза печени в практике врача ультразвуковой диагностики / М. А. Басарукин, Е. Б. Петрова, Н. В. Тюрина // Радиология - практика. – 2021. – № 1(85). – С. 92-96.
3. Вафин, А. З. Влияние цитокинов на течение послеоперационного периода при эхинококкозе печени / А. З. Вафин, Е. В. Машурова // Медицинский вестник Северного Кавказа. – 2016. – № 3. – С. 13-15.
4. Дифференцированная тактика хирургического лечения эхинококкоза печени / Ш. Н. Усаров, Х. А. Умиров, Д. Б. к. Юсупалиева, Ю. М. к. Тилавова // Вопросы науки и образования. – 2019. – № 2(45). – С. 103-110.
5. Котельникова, Л. П. Эхинококкоз печени в неэндемичном регионе / Л. П. Котельникова, Г. Ю. Мокина, А. Н. Федачук // Хирургия. Журнал им. Н.И. Пирогова. – 2022. – № 8. – С. 61-68.
6. Назиров Ф.Г. Иммунологические аспекты хирургии эхинококкоза печени // Аналы хирургической гепатологии - 2019 - No 1 - С 16-25.
7. Опыт лечения эхинококкоза печени / Р. С. Шило, Э. В. Могилевец, К. С. Белюк [и др.] // Гепатология и гастроэнтерология. – 2023. – Т. 7, № 1. – С. 67-73.

8. Пути улучшения результатов хирургического лечения эхинококкоза печени на фоне цирроза / Г. В. Павлюк, Г. А. Ангелич, В. А. Морару [и др.] // Вестник Кыргызской государственной медицинской академии имени И.К. Ахунбаева. – 2023. – № 4. – С. 74-77.
9. Тоиров А. С., Хамдамов А. Б. Жигар эхинококкэктомиясидан сўнги фиброз капсула қатламидаги герминатив элементларга фотодинамик терапиянинг антипаразитар таъсирини экспериментал – морфологик асосланиши // Доктор ахборотнома. – 2022. – №3(106). – С.121-126.
10. Тоиров А.С., Хамдамов Б.З. Оптимизация методики обработки остаточных полостей после эхинококкэктомии печени с помощью лазерной фотодинамической терапии // Мутафаккир. – №3, – 2022. – С. 47-53.
11. Тоиров А.С., Хамдамов Б.З., Бабажанов А.С.,Ахмедов А.И. Экспериментал-морфологик усулда жигар эхинококкэктомиясидан кейинги қолдиқ бўшлиқга фотодинамик терапиянинг антипаразитар таъсирини асослаш// Биология ва тиббиёт муаммолари. – 2022, – №6.1(141). – С. 357-361.
12. Тоиров А.С., Хамдамов Б.З., Бабажанов А.С. Инновационный метод обработки остаточных полостей после эхинококкэктомии печени// Биология ва тиббиёт муаммолари – 2021– №6.1 (133) – С. 376 – 379
13. Тоиров А.С., Хамдамов Б.З., Хамдамов А.Б. Тажрибада эхинококк натив суюқлигига фотодинамик терапия таъсирининг морфологик жиҳатлари // Биология ва тиббиёт муаммолари. – 2022, – №4 (137) – С. 249-254.
14. Хирургическое лечение рецидивного цистного эхинококкоза печени / А. Ю. Анисимов, А. О. Мохаммед, И. М. Оспенников, Р. М. Минабутдинов // Вестник современной клинической медицины. – 2021. – Т. 14, № 6. – С. 124-130.
15. Эффективность нерезекционных методов хирургического лечения эхинококкоза печени / А. О. Краснов, К. А. Краснов, В. А. Пельц [и др.] // Известия высших учебных заведений. Поволжский регион. Медицинские науки. – 2023. – № 2(66). – С. 12-21.
16. Эхинококкоз печени в хирургической практике / С. Н. Стяжкина, А. Е. Жернакова, Е. Л. Азимова, Н. А. Завьялова // Дневник науки. – 2021. – № 4(52).
17. Brunetti E., Kern P., Vuitton D.A. Expert consensus for the diagnosis and treatment of cystic and alveolar echinococcosis in humans. Acta Trop., 2020, 114 (1): 1-16.
18. Gentilini M., Pinon J.M. [Value of electrosynthesis (or immuno-electro-diffusion) on a cellulose acetate membrane in hydatidosis diagnosis. A comparative study with other precipitation tests]. Ann. Med. Interne (Paris), 2022, 123 (10): 883-886.
19. Manterola C., Barroso M., Vial M., Bustos L., Munoz S., Losada H. et al. Liver abscess of hydatid origin: clinical features and results of aggressive treatment. ANZ journal of surgery, 2023, 73 (4): 220- 224.
20. Ciftci TT, Yabanoglu-Ciftci S, Unal E, Akinci D, Baysal I, Yuce G, Dogrul AB, Orsten S, Akhan O, Nemutlu E. Metabolomic profiling of active and inactive liver cystic echinococcosis. Acta Trop. 2021 Sep;221:105985.
21. Daipert-Garcia D, Virginio VG, Oliveira FB, Siqueira NG, Ferreira HB, Rodrigues-Silva R. Evaluation of two heterologous recombinant antigens for the serological diagnosis of human polycystic echinococcosis. J Helminthol. 2022 Mar 17;96:e21.
22. Gentilini M., Pinon J.M. [Value of electrosynthesis (or immuno-electro-diffusion) on a cellulose acetate membrane in hydatidosis diagnosis. A comparative study with other precipitation tests]. Ann. Med. Interne (Paris), 2022, 123 (10): 883-886.
23. Gharbi H.A., Hassine W., Brauner M.W., Dupuch K. Ultrasound examination of the hydatic liver. Radiology, 2021, 139 (2): 459-463.
24. Kalra V., Dua T., Kumar V. Efficacy of albendazole and short-course dexamethasone treatment in children with 1 or 2 ring-enhancing lesions of neurocysticercosis: a randomised controlled trial. J. Pediatr., 2023, 143 (1): 111-114.
25. Peters L, Burkert S, Gruner B. Parasites of the liver epidemiology, diagnosis, and clinical management in the European context. J Hepatol 2021; 75:202–218.
26. Torgerson P.R. Transmission dinamies and control option for cysts echinococcosis / P.R.Torgerson // Parazitolosy - 2023 - Vol. 127 - P. 143-158.
27. Mirkhodjaev I.A., Hamdamov B.Z., Kubanov O.M. Experimental Echinococosis During Administration of Rolyaver Liposomes // Eur.Chem.Bull, - Hungary, 2023. – №12(8). – P. 8319-8321.
28. Mirkhodjaev I.A., Teshayev Sh.J., Akhrorova L.B. Effect of Liposomal on the Development of Experimental liver Echinococosis //American Journal of Medicine and Medical Sciences, - USA, 2023. – №13(7). – P. 910-912.

29. Khamdamov B.Z., Mirkhodjayev I.A., Akhrorova L.B. Ways to improve the results of surgical treatment of lever echinococcosis // Тиббиётда янги кун, - Бухара, 2023. – №11 (61). – С. 14-17.
30. Hamdamov B.Z., Toirov A.S., Babajanov A.S., Hamdamov I.B., Hamdamov A.B. Laser photodynamic therapy as a method of treatment of residual cavity after liver echinococcectomy // Europe's Journal of Psychology, – 2021, – Vol. 17(3), – P. 293-297.
31. Khamdamov B.Z., Khamdamov I.B., Khamdamov A.B., Toirov A.S., Babajanov A.S. Laser photodynamic therapy as a method of treatment of residual cavity after liver echinococcectomy/ Биомедицина ва амалиёт журнали. – 7 жилд, – №4 сон, –2022. –Р.- 416-422. (14.00.00; №24).
32. Toirov A. S., Khamdamov B. Z. The Effect of Laser Photodynamic Therapy on Treatment of Residual Cavities after Liver Echinococcectomy // Ra journal of applied research. India. – Volume: 08. –2022. – P. 396-397.