

Optimization of Surgical Tactics for Hydatid Echinococcosis of the Liver

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Abstract The authors note that echinococcosis is a severe parasitic endemic disease and is a serious medical and social problem in many countries of the world, including the Republic of Uzbekistan. However, there are still no clear recommendations and guidelines regulating the scope of surgical intervention in a given clinical situation, and the issues of anti-scolecidal treatment of surgical field and ways to prevent complications of liver echinococcosis have not been fully studied. The authors note that the choice of surgical tactics for hydatid liver echinococcosis depends on the nature of the lesion, the number and size of hydatid cyst, as well as on the choice of the most optimal access and methods of isolating the surgical field; antiparasitic treatment of cysts and rational drainage of residual cavities, based on the principles of a parasitic and antiparasitic echinococectomy, increasing the radicality of operations and sharply reducing the likelihood of disease relapses.

Keywords Hydatid echinococcosis of the liver, Liver resection, Puncture treatment, Laparoscopic echinococectomy

1. Relevance of the Problem

Echinococcosis is a severe parasitic endemic disease and is a serious medical and social problem in many countries of the world, including the Republic of Uzbekistan [2,3,7]. To date, significant experience has been accumulated throughout the world in the surgical treatment of echinococcosis, but there are still no clear recommendations and guidelines regulating the scope of surgical intervention in a given clinical situation, and the issues of anti-scolecidal treatment of surgical field and ways to prevent complications of liver echinococcosis have not been fully studied [1,6]. This is due to the increasing migration of the population, the deterioration of the epidemiological situation, and the low level of medical examination of the population [4,5,8].

In this regard, in this work, an attempt was made to improve the results of surgical treatment of liver echinococcosis and its complications by developing an algorithm of actions when choosing the method of primary and repeated surgical intervention, as well as further improving ways to prevent complications.

The aim of the research is to improve the results of treatment of hydatid echinococcosis of the liver by developing a treatment and diagnostic algorithm, as well as a differentiated approach to the development of complications.

2. Material and Research Methods

This research is based on the results of examination and treatment of 217 patients with liver echinococcosis and its complications, who are conditionally divided into 2 groups:

- comparison group - 124 (57.2%) patients with hydatid liver echinococcosis, for the period from 2016 to 2019. (before applying the developed methods).
- main group - 93 (42.8%) patients with hydatid liver echinococcosis, for the period from 2020 to 2023 (prospective part of the study).

To solve the assigned problems, general clinical, laboratory, instrumental and statistical research methods were used in accordance with protocols approved by the Ministry of Health of the Republic of Uzbekistan.

3. Results and Its Discussion

The average age was 40.5 years, with a female to male ratio of 2:1 (58.9 - 41.1% and 38.8 - 61.2%).

The analysis noted that in the comparison group, surgical field most often affects females - 58.9%, and males - 41.1%. In the main group - 61.2% and 38.8%, respectively. This factor confirms that the female part of the population, with their anemia, reduced immunity, etc., is mainly responsible for caring for livestock. At the same time, in 70.5% of cases it was the most able-bodied part of the population (18-45

years old). The incidence in adolescence and young adulthood in the comparison group was 83 (66.9%), and in the main group 70 (75.3%), respectively. Patients over 60 years old, in the comparison group were 12 (9.7%), and in the main group - 7 (7.6%), and those aged 75 years and above - 8 (6.4%) and 3 (3.2%), respectively.

Rural residents predominated in both groups. There were 44.4% (55) urban residents in the comparison group, 45.2% (42) in the main group, 55.6% (69) and 54.8% (51) rural residents, respectively. The difference in the proportion - 11.2% and 9.6% indicates an increase in morbidity among the urban population, which is associated with increased migration of the population to cities and the deterioration of the general epidemiological situation.

Damage to the right lobe occurred in 97 (78.3%) in the comparison group and 70 (75.2%) in the main group. Isolated damage to the left lobe was noted in 19 (15.3%) patients in the comparison group, and in the main group - in 16 (17.2%), both lobes were affected - 8 (6.4%) and 7 (7.6%), respectively. At the same time, there was a prevalence of solitary hydatid cyst: in the comparison group it was 58.0% (72 patients), in the main group it was 51.6% (48 patients).

Hydatid cysts were most often localized in the right lobes of the liver, occurring in (78.3% and 75.2%) patients. We noted that in most cases - in 97 (78.3%) patients in the comparison group and in 70 (75.2%) in the main group, the cysts were located in the subdiaphragmatic region (VII-VII-I segments), which significantly complicated the implementation operations.

More often there was a combined lesion of two or three segments - 60 (48.3%) in the comparison group and 52 (55.9%) in the main group, with predominant damage to the right lobe of the liver - in the VIII segment, combinations VII-VIII, as well as V-VI-VII and VI-VII-VIII segments.

In 56 (25.8%) cases, the diameter of the hydatid cyst exceeded 5 cm. The size of the hydatid cyst within 6-10 cm in diameter in the comparison group was 78 (62.9%) and in the main group - 58 (62.3%) cases. Large cysts were diagnosed in 14 (11.2%) and 11 (11.8%) cases, respectively. Complications of hydatid cyst were identified in 90 (41.5%) cases. Among the complicated forms of liver echinococcosis, suppuration and calcification of the hydatid cyst were most often noted: in 23 (18.6%) and 21 (22.5%), respectively.

The presence of biliary fistulas (2 and 3), which are a conduit for the introduction of infection into the cyst through bile, which are formed due to cracking and open into the cavity occupied by the hydatid cyst, is also considered as a complication of echinococcosis. At the same time, hydatid cyst rupture was present in 2 (1.3%) patients in the comparison group and in 3 (3.2%) patients in the main group.

Our analytical forecast showed that out of 124 patients in the comparison group, 15 (12.1%) patients had a high risk ($1 < R < 2$) of developing CR, and 30 (24.1%) patients had a very high risk ($R > 2$) (patients with suppuration, rupture into the bile ducts, biliary fistula and hydatid cyst rupture).

The analysis showed that from a practical point of view, with hydatid cyst sizes of 7 cm or more in diameter, the

absolute risk of developing preoperative complications was 9.45% (43 out of 455 cysts), which is significantly higher than the risk indicator for smaller cyst sizes ($\chi^2 = 14.8$; $p = 0.0001$). The absolute risk of developing complications for cysts up to 6 cm in diameter was 0.016 (1.6%). It can be stated that EC with a diameter of 7 cm or more is critical ("cutting point") and acts as a clinically significant risk factor.

With risk indicators $R > 1$, the probability of the occurrence of predicted complications increased significantly in 12 patients. All cases of very high risk probability ($R > 2$) CR were identified in 21 patients. The inclusion of the obtained data in the risk factor made it possible to increase the reliability of the system for individual prediction of the likelihood of developing software development in the main group.

A significant proportion of patients - 130 (59.9%) sought medical help within a period of up to 1 year, 69 (31.8%) within 1-5 years, and 18 (8.3%) patients within a period of more than 5 years.

In the comparison group, in 71 (57.2%) patients with liver echinococcosis, the duration of the disease at the time of surgery was less than 1 year. At the same time, a period from 1 to 5 years was detected in 42 (33.8%), more than 5 years - in 11 (8.8%). In the main group, a similar picture was observed: liver echinococcosis with a disease duration of up to 1 year at the time of surgery was in 59 (63.4%), with a duration of 1 to 5 years in 27 (29.0%), and more than 5 years in 7 (7.5%) patients.

The clinical symptomatology of the disease was nonspecific: in most cases, weakness and malaise were noted in 101 (81.4%) patients in the comparison group and in 77 (82.8%) in the main group. Pain and a feeling of heaviness in the abdomen were noted in 101 (81.4%) and 75 (80.6%) patients, respectively. At the same time, we did not note specific directions of pain irradiation. We also did not find a relationship between pain syndrome and the dietary pattern of patients.

An increase in body temperature observed in 23 (18.5%) and 21 (22.5%) cases, respectively, together with the data of instrumental examination, allowed us to suspect suppuration of the cyst. Hepatomegaly with bulging of the right hypochondrium was observed with large sizes of hydatid cyst was diagnosed in 14 (11.2%) and 11 (11.8%) patients, pain and a feeling of heaviness in the chest were noted in 14 (3.2%) and 2 (2.1%) patients, while symptoms were accompanied by cough in 11 (8.8%) and 5 (5.3%) of them, respectively.

The presence of free fluid in the abdominal cavity - in 1 (0.8%) and 2 (2.1%) cases, respectively. At the same time, the clinical picture of a catastrophe in the abdominal cavity was present in all cases. Of particular note are cases of breakthrough into the pleural cavity, which we observed in 2 (1.6%) patients in the comparison group and in 1 (1.1%) of the main group. The appearance of these signs was not associated with the volume of the existing cyst and the amount of fluid poured into the pleural cavity, because in

both cases, the volume of fluid spilled into the pleural cavity did not exceed 300 ml, and the perforation hole was no more than 3 cm.

We observed breakthrough of the cyst into the biliary tract in 3 (2.4%) cases of the comparison group and in 1 (1.1%) patients of the main group. Of these, in 3 and 1, a clinical picture of obstructive jaundice was observed, due to obstruction of the bile ducts by daughter and grandchild bladders.

Surgical interventions were performed according to the principles of aparasitic and antiparasitic. Both laparotomic EE (traditional) and minimally invasive echinococectomy were performed: laparoscopic interventions, puncture-drainage operations (PAIR-PD). Technical difficulties during surgical intervention for liver echinococcosis were mainly associated with surgical access, which was determined taking into account the localization of cysts in a particular lobe of the liver and their number.

When the right lobe of the liver was affected, laparotomy using a superomedial approach was performed in 55 (44.3%) patients. With damage to the left lobe in 17 (13.7%) patients and with combined damage to both lobes of the liver, the superomedial approach was used in 7 (5.6%) patients.

The oblique right hypochondrium approach was used in 34 (27.4%) patients. Laparoscopic access was attempted in 5 (4.1%) patients. Percutaneous transhepatic access to perform EE was used in 6 (4.8%) patients.

In the comparison group, closed echinococectomy was performed in 30 (24.2%) patients, semi-closed - in 25 (20.1%), open echinococectomy with drainage of the surgical field - in 35 (28.2%) and combined in 23 (18.6%) patients.

In the comparison group, isolation of the surgical wound and surgical space was carried out in a standard way (large napkins); an alcohol solution of iodine was used to treat surgical field, in some cases a solution of furacillin, where in 5 (6.5%) patients this led to the development of relapse of liver echinococcosis. Pre- and postoperative management of patients was aimed at correcting the impaired functions of the patient's organs and did not differ from the generally accepted principles of management of patients with abdominal pathology. In the presence of a suppurating cyst, the surgical field was drained with only one and rarely two polyvinyl chloride tubes.

Semi-closed echinococectomy was performed in 25 cases and open EE in 35 cases. In the surgical field, in 43 (34.6%) cases one drainage tube was left and in 10 (8.1%) cases - two.

In 11 patients out of the first 43 patients, suppuration of surgical field was established, which manifested itself with symptoms characteristic of suppuration, which were confirmed by ultrasound. The lack of clear indications when choosing a surgical approach, the volume of surgical treatment, the method of treatment and elimination of surgical field led to the development of various types of postoperative complications and unsatisfactory results in the separate period.

17 out of 124 operated patients experienced various complications, including suppuration of surgical field. In the

early postoperative period, 13 patients underwent relaparotomy and 1 had puncture intervention under ultrasound guidance.

In patients of the main group, during the preoperative preparation period, to improve liver function, in combination with other drugs and chemotherapy, the use of hepatoprotectors along with drugs that improve its functional state became a prerequisite: Essentiale Forte 300 mg, Hepamerz 10 g. per 400 ml of infusion solution, ascorbic acid 5% -6.0, Riboxin 2% -10.0 intravenously. In the pre- and postoperative period, chemotherapy with albendazole, metronidazole and furazolidone was carried out in all patients.

The drug Albendazole was taken according to the regimen developed in the clinic depending on the size and number of cysts. For the purpose of immunostimulation, we used immunomodulin 1.0 intramuscularly or Immunal, 1 tablet 4 times a day. As a result, in the early postoperative period, total bilirubin in patients of the main group averaged $16.2 \pm 2.1 \mu\text{mol/l}$, and in the control group - $30.6 \pm 6.2 \mu\text{mol/l}$.

In the process of research, we developed an algorithm of actions in terms of diagnosis and choice of surgical method, which contributed to the optimization of surgical tactics (DGU No. 31205 - dated December 15, 2023). According to the proposed algorithm, clinical and anamnestic data (complaints, medical history and life history) were determined. Afterwards, we began clinical, laboratory, and instrumental studies. The conducted studies made it possible to determine the choice of type and volume of surgical intervention.

In all cases, preoperative preparation included antiparasitic chemotherapy depending on the diameter and number of hydatid cysts, immunotherapy, and hepatoprotectors. It is important during this period to carry out measures to reduce intra-cystic pressure: antiparasitic chemotherapy with albendazole, antibacterial therapy (levofloxacin - 500-750 mg IV, in combination with ceftriaxone 1-2 g IV or metronidazole - 500 mg IV, in combination with ceftriaxone - 1-2g i.v.

For large cysts and difficult localization (VII-VIII), with the presence of daughter grandson bladders (cysts CE2, CE3, CE5), traditional laparotomic approaches are preferable.

When the process is localized in the VII-VIII, II-III-IV segments, a superomedial approach with dissection of the round and falciform ligaments is used. If both lobes of the liver are affected, use the upper median approach using a Segal retractor; V-VI segments - right-sided oblique approach; in segments II-III-IV - superomedial approach with dissection of the round and falciform ligaments.

For cysts with a diameter of 5-6 cm, and for solitary cysts localized in the right lobe of the liver (V-VI) and in some cases with damage to the left lobe, hydatid cyst preferably II-III-IV segments, laparoscopic approaches are considered preferable. Performing laparoscopic operations is considered safer in terms of dissemination for suppurated hydatid cyst, i.e. with dead germinal elements (CL and CE4 cysts).

We also use puncture approaches for solitary and uncomplicated cysts (solitary, intraparenchymal hydatid hydatid cyst), preferably with a cyst diameter of no more

than 5 cm (CL, CE1 cysts). We consider it advisable to include intraoperative ultrasound during the operation and regardless of the method used.

During surgical interventions for hydatid liver echinococcosis, open, closed semi-closed, IEE, pericystectomy, traditional echinocoectomy, laparoscopic echinocoectomy, PAIR-PD were used according to the developed and implemented diagnostic and treatment algorithm.

After EE, the cyst cavity was treated in the following sequence: a 96° alcohol solution, a 0.5% alcohol solution of albendazole and a 5% iodine solution were used. The edge of the excised fibrous capsule was coagulated.

In the postoperative period, preventive chemotherapy was carried out in combination with hepatoprotectors and immunological correction. Sanitation of the surgical field was carried out with solutions of furacillin, hypertonic solution of sodium chloride (20%) with an exposure of 7-10 minutes, dioxidine (1%), and decasan solution.

In case of fluid accumulation in the surgical field (biliary fistula, bleeding), percutaneous puncture drainage (PAIR-PD) was performed under ultrasound guidance. In cases of ineffective drainage, laparoscopy was performed.

In the main group, we developed differentiated surgical tactics. Of 93 (42.8%) patients, traditional echinocoectomy was performed in 54 (58.1%), laparoscopic echinocoectomy - in 24 (25.8%), puncture (PAIR-PD) - in 15 (16.1%) patients.

We used a superior midline incision in 37 (39.7%) patients. The oblique right hypochondrium approach was used in 17 (18.2%) patients. Laparoscopic access was used in 24 (25.8%) patients. Percutaneous transhepatic access to perform echinocoectomy was used in 15 (16.1%) patients. After laparotomy, the abdominal cavity was limited with gauze pads moistened with a 0.5% alcohol solution of albendazole. In 25 (26.8%) cases, a pronounced adhesive process was established with neighboring organs, which were separated after cystotomy.

For puncture, a thick needle was used, which was connected to a syringe or to a vacuum suction device. The surgical field was sanitized with a 96° alcohol solution, a 0.5% alcohol solution of albendazole and a 5% iodine solution.

Various types of closed echinocoectomy were performed (capitonnage, FC intussusception, FC debridement, IEE, pericystectomy, combined echinocoectomy), economical liver resections (hemihepatectomy, segmentectomy, FC debridement) 13.9% and minimally invasive interventions - 25.8% and 16.1%. In this case, preference was given to organ-saving operations.

In the main group, closed echinocoectomy was performed in 13 (13.9%), semi-closed - in 13 (13.9%), open echinocoectomy with drainage of the surgical field - in 15 (16.1%) and combined - in 13 (13.9%) patients.

Rational drainage of the surgical field is an important stage of echinocoectomy. To drain the surgical field, we use through drainage tubes. The abdominal cavity is additionally drained. If necessary, the drainage tube is replaced with a thinner one. The method was used in 5

(5.4%) patients; drainage of the surgical field according to the "flow system" type in 42 patients; fixation of drainage using the "fold" principle - 15 (16.1%). Through drainage was used in the intrahepatic location of two closely spaced hydatid cysts, with a risk of liver damage.

Pericystectomy was performed in 15.9% of patients. Postoperative treatment in hospital was 13.6 ± 0.8 bed days. The length of hospital stay was 8.4 ± 1.6 bed days. The mortality rate among these patients was 1.2%. In 8 (14.3%), leakage of bile through the drainage and suppuration of the surgical field was detected. Relapse was diagnosed in 5.3% of cases. For subdiaphragmatic cysts, drainage of the right subdiaphragmatic space was carried out according to Melnikov.

Puncture treatment of parasitic cysts was used when they were intraparenchymal located mainly in segments I, VII, VIII, with a diameter of up to 5 cm and with recurrent liver echinococcosis. Contraindications are: multi-chamber hydatid cyst types III-IV-V with partial or complete calcification of the fibrous capsule, as well as complicated by a breakthrough into the bile ducts, abdominal or pleural cavity.

In 24 (25.8%) patients, operations were performed using the videolaparoscopic method and in 15 (16.1%) PAIR-PD.

In the main group, 24 (25.8%) laparoscopic echinocoectomy were performed in patients with uncomplicated single-chamber cysts in 4 (3.2%) patients with an hydatid cyst diameter of 5 cm in 2 (2.1%), from 6 to 10 cm and in 21 (22.5%), with an hydatid cyst diameter of 11-20 cm - in 1 (1.1%). Mainly when the right lobe was affected by one cyst in 16 (17.2%) patients, the left lobe also in 5 (5.4%), in 3 (3.2%) cases when both lobes of the liver were affected. The technique (PAIR-PD) was mainly performed with an hydatid cyst diameter of 5 cm - in 15 (16.1%) patients.

Laparoscopic EE was performed in the presence of up to 2 to 3 liver cysts with a diameter of 5-7 cm, in some cases 11 cm. Indications for laparoscopic EE from the liver are: - cysts of types CL, CE1-CE4 with localization in the 3-6th segments; partial superficial location; size not less than 5 cm; cysts of the 1st, 7th and 8th segments, intraparenchymal cysts of any size and cysts of types CE2-CE3.

To completely remove the chitinous shell with its elements, we resorted to replacing the drainage with a thicker one. When performing percutaneous EE, we injected "Trypsin" into the cyst cavity, the drainage was blocked for 2 hours, which allowed us to reduce the time for washing the chitinous membrane to 1-2 days. Bleeding that occurred in 2 (2.1%) patients during percutaneous operations required laparoscopy, also when suppuration of surgical field occurred in 1 (2.1%). In the immediate postoperative period, when suppuration of surgical field occurred, PAIR-PD was used in 3 (3.2%) patients. Endoscopic papillosphincterotomy (EPST) was performed in 3 patients. In the presence of cystobiliary fistulas, we used a superselective antispasmodic sphincter of Oddi at a dosage of 200 mg 3 times a day 30 minutes before meals. As a result, the period for closure of fistulas was reduced from 14 to 7 days.

4. Conclusions

Thus, the choice of surgical tactics for hydatid hydatid cyst depends on the nature of the lesion, the number and size of hydatid cyst, as well as on the choice of the most optimal access and methods of isolating the surgical field; antiparasitic treatment of cysts and rational drainage of residual cavities, based on the principles of a parasitic and antiparasitic echinococectomy, increasing the radicality of operations and sharply reducing the likelihood of disease relapses.

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