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Current trends in surgical treatment of liver echinococcosis

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Abstract. The choice of the optimal method of surgical treatment of hepatic echinococcosis continues to be a subject of debate in the surgical community. Despite the historical priority of organ-preserving approaches, radical methods of surgical intervention on the liver have been actively developed and introduced into clinical practice in recent years. The purpose of the study was to analyse the immediate and long-term results of the use of organ-preserving and radical surgical interventions in hepatic echinococcosis. 362 patients with hydatid echinococcosis of the liver were examined. Of these, 302 (75.8%) had primary echinococcosis and 60 (24.2%) had recurrent echinococcosis. There were 179 men (49.5%) and 183 women (50.5%). Conventional surgical procedures were performed in 232 (64.1%) patients with hepatic echinococcosis. With conventional echinococcectomy, postoperative mortality was 0.9%, postoperative complications developed in 47 patients, which was 20.3%, and disease recurrence was observed in 11 (4.7%) patients. The most frequently observed residual cavity after echinococcectomy was in 29 (12.4%) patients, including suppuration of the residual cavity in 10 (4.3%) patients. Radical surgical treatment of hepatic echinococcosis was performed in 130 patients, of whom 2 (1.5%) died. After radical surgery, specific complications were noted in 18 patients, which amounted to 13.8%. The most common complications were haemorrhagic and biliary complications, which were detected in 9 patients. Intra-abdominal bleeding occurred in 5 patients, of which 4 had less intense bleeding and was stopped after haemostatic therapy, and one patient underwent a relaparatomy and bleeding was stopped early after surgery. Liver failure developed in two patients who underwent liver resection and combined operations, which were corrected with drug treatment. Radical operations with removal of the fibrous capsule with all pericystic liver tissues (pericystectomy and resection) contribute to improving the immediate and long-term results of surgical treatment of echinococcosis

Keywords: echinococcosis; antisepsis; echinococcectomy; resection; pericystectomy; relapse prevention

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Introduction

Despite the successes achieved in the treatment of hepatic echinococcosis, the problem of echinococcosis remains relevant in Central Asia, including in the Republic of Kyrgyzstan [1,2]. There is no consensus on the choice of surgical approaches and treatment tactics for this disease [3,4]. In recent years, along with conventional methods of treatment with preservation of the fibrous capsule, radical methods of surgical intervention on the liver have been widely introduced [5-7]. The final decision on surgical tactics was made based on laparotomy and revision of the abdominal cavity.

The nature and scope of surgical interventions were determined considering the localisation, size, stage of development of the disease, and the general condition of the patients. The results of surgical treatment of hepatic echinococcosis were assessed by the number of postoperative complications, mortality, recurrence, and residual cavity. According to the literature, the recurrence rate after surgical treatment of echinococcosis ranged from 4.5-49.5%, and suppuration of residual cavities was 15-20% [8,9].

Relapse developed after incomplete removal of the parasite, its scolexes can remain in the fibrous capsule or penetrate into the depths of the liver tissue. Therefore, removal of the fibrous capsule is one of the main approaches to preventing recurrence of the disease. Consequently, based on the above, it seems relevant to choose the type of radical surgery for hepatic echinococcosis for the prevention of postoperative complications and recurrence of the disease. The purpose of the study was to analyse the immediate and long-term clinical outcomes in the use of organ-preserving and radical surgical methods for the treatment of hepatic echinococcosis.

Materials and Methods

The study was conducted at the Department of General Surgery with a course in Combustiology at the Kyrgyz State Medical Academy (KSMA) based at City Clinical Hospital No. 1 (CCH No. 1), Bishkek. The retrospective study included patients who received inpatient treatment in the surgical departments of CCH No. 1 between 2015 and 2023 with a verified diagnosis of hydatid hepatic echinococcosis, established based on a complex of clinical, instrumental (ultrasound, CT) and immunological (ELISA, ICL) methods.

The study was conducted in accordance with the provisions of the Declaration of Helsinki. A total of 362 patients with hydatid hepatic echinococcosis were included in the trial. Of these, there were 315 (87.1%) patients with primary echinococcosis, 47 (12.9%) with recurrent echinococcosis. Men – 182 (50.3%), women – 180 (49.7%). The age of the patients ranged from 20 to 72 years. The group consisted mainly of patients aged 20 to 55 years (59.7%). The duration of the disease ranged from 6 months to 5 years or more.

Solitary cysts were detected in 328 (90.6%) patients, and multiple cysts in 41 (9.4%). There were 17 (4.5%) patients with combined forms of echinococcosis of the liver and other organs. Among patients, the right lobe was affected in 262 (72.4%) cases, the left lobe – 62 (17.1%), both lobes – 38 (10.5%). The size of echinococcal cysts ranged from 2 cm to 15 cm in diameter or more. Small cysts up to 5 cm were found in in 29 (7.6%) patients, medium cysts from 5 cm to 10 cm in diameter – in 165 (43.5%), large cysts – in 150 (39.6%), and giant cysts from 15 cm in diameter or more – in 35 (9.2%) patients. Most of them (92.3%) were smaller than 15 cm in diameter.

For the purpose of antiparasitic treatment of the fibrous capsule cavity, a hypertonic solution was used in 120 (33.1%) cases, an ozonated solution – in 51 (14.1%) cases, Decasan -in 35 (9.7%) cases, and a Dimexide solution – in 156 (43.1%) cases All patients underwent a complex of clinical and laboratory-instrumental studies, in addition to general clinical studies (general blood, urine, liver tests, electrocardiography (ECG), fluorography (FLG), ultrasound examination (US) before surgery, at the time of its execution and upon discharge, and immunological tests (intradermal allergic reactions (IAR), enzyme immunoassay (ELISA), immunochemiluminescence (ICL). If necessary, spiral computed tomography (CT) with bolus contrast enhancement and intraoperative ultrasound (IOUS) were used to clarify the location of the cyst in relation to large vessels and biliary tract.

The following methods of surgical treatment of hepatic echinococcosis were used: conventional methods with preservation of the fibrous capsule – 234 (61.7%) and radical operations – 145 (38.3%). The most commonly used procedure was upper midline laparotomy with consideration of the segmental localisation of the cyst in the left lobe of the liver. Standard abdominal approaches (Fedorov, Kocher, Cherney) were used for cysts located in the area of 4-6 segments of the liver. Thoracoabdominal access was used for cysts located in the subdiaphragmal and posterior segments of the liver (segment 8).

Results

The choice of treatment for hepatic echinococcosis depends on the location, number and size of parasitic cysts, the nature of complications, and the severity of the patient's condition. Four types of surgical interventions were used to eliminate the cavity of the fibrous capsule during organ-preserving operations. The residual cavity was eliminated in 48 (20.0%) cases using the Delbe method with placement of a draining microirrigator. The method of fibrous capsule invagination was performed in 53 (24.3%) patients with hepatic echinococcosis, and in 19 patients according to the method developed by the clinic. In 39 cases, the Askerkhanov omentoplasty technique was used to eliminate the

residual cavity. This technique was mainly shown for deep-seated echinococcal cysts, with large cysts with a thick deformed fibrous capsule wall, when it was impossible to eliminate them by other methods. In cases of large echinococcal cysts located in the subdiaphragmatic surface of the liver, 33 (15.2%) patients underwent echinococcectomy with partial pericystectomy and abdominisation of the residual cavity. This technique was used by the authors for small uncomplicated cysts without biliary fistulas.

Postoperative complications developed in 44 patients (20%). The most common specific complications were observed after removal of the residual cavity using the Delbe capitonage technique (36.4%), then after drainage (22.7%), invagination (18.2%), and partial cystopericystectomy (CPE) with abdominisation (13.6%). Among postoperative complications, complications associated with the development of residual cavities (RC) were frequently observed in 20 (45.5%) patients, and suppuration of residual cavities in 8 (18.2%) patients. The authors of the study suggest that the reason for the development of RC was leaky suturing of the fibrous capsule cavity due to inadequate drainage, and the suture cutting through the relatively rigid wall of the fibrous capsule during Delbe capitonnage (an invagination technique). In 6 cases, percutaneous drainage of the RC was performed under ultrasound guidance, and in two patients, relaparotomy with drainage of the residual cavity was carried out due to the failure of the minimally invasive intervention.

In 4 patients, an external gallbladder fistula appeared after surgery; in all cases, bile leakage closed on its own within 2-5 weeks. Postoperative bleeding developed in 3 patients, in two cases the bleeding was stopped conservatively, and one had a relaparotomy. Reactive pleurisy was observerd in 6 patients after echinococcectomy of the subdiaphragmatic surface of the liver, in all cases, a pleural cavity puncture and Bulau drainage were performed. Long-term results of surgical treatment ranged from 1 to 5 years – 169(88.9%) patients were under observation. Recurrence of the disease was detected in 8 patients (4.7%), namely, after capitonnage (2 cases), invagination (1 case), drainage (2 cases), partial cystopericystectomy with abdominisation (2 cases), omentoplasty (1 case). 1 patient died of acute heart failure. Four types of surgical intervention were used in the radical treatment of echinococcosis (Table 1).

Table 1. Distribution of types of radical surgical procedures

Type of surgical intervention	Number of patients	Specific gravity (%)
Liver resection (anatomical or atypical)	40	30.7%
Ideal echinococcectomy (cyst removal without damage to the fibrous capsule)	29	22.3%
Subtotal pericystectomy (cyst removal with partial resection of the fibrous capsule)	24	18.5%
Combined radical surgeries (for example, liver resection + pericystectomy on another segment)	20	15.4%
Total pericystectomy (removal of the cyst together with the fibrous capsule)	17	13.1%
TOTAL:	**130**	**100%**

Source: compiled by the authors

Radical surgical treatment of hepatic echinococcosis was performed in 130 patients, with 2 deaths (1.5%) recorded Liver resection became the leading method of radical treatment (30.7%), which is probably conditioned by the large size of cysts, their central location, multiple lesions of one lobe, or the development of complications (suppuration, biliary fistulas), making organ-preserving surgery unsafe. Organ-preserving operations (ideal and total pericystectomy) were performed in 35.4% of patients (22.3% + 13.1%), reflecting the surgeons' desire to preserve the functional liver parenchyma as much as possible, provided it is technically feasible and there are no contraindications. Subtotal pericystectomy (18.5%) is often a necessary measure during the transition of the process to critical structures (large vessels, bile ducts), when complete removal of the capsule is associated with a high risk of intraoperative complications. Combined operations (15.4%) were used for complex, multiple, or combined lesions requiring a combination of different surgical techniques to achieve radicalisation.

After radical surgery, specific complications were noted in 18 patients, which amounted to 13.8%. Complications most often developed after liver resection (8 cases) and combined operations (5 cases), less often with radical pericystectomy (5 cases) and ideal echinococcectomy, which was associated with the severity of the condition, the complexity and volume of the operation. The most common complications were haemorrhagic and biliary complications, which were detected in 9 patients. Postoperative biliary complications in the form of bile leakage and biliary fistulas were significantly more common, which in most patients stopped on their own without additional manipulations. Intraperitoneal bleeding occurred in 5 patients, of which 4 had less intense bleeding and was stopped after haemostatic therapy, and one patient underwent a relaparatomy and bleeding was stopped early after surgery. Liver

failure developed in two patients who underwent liver resection and combined surgery, which was corrected with drug treatment. Mortality after radical operations was recorded in 2 (1.5%) patients due to cardiovascular failure and thromboembolism.

Discussion

The key problem in hepatic echinococcosis surgery remains the dilemma of choosing between organ-preserving and radical tactics. This choice represents a compromise between intraoperative safety and long-term efficacy, which requires a comprehensive assessment of both surgical risks and pathophysiological consequences. The data obtained by the authors clearly indicate that the main source of specific postoperative complications was a residual cavity – a fibrous capsule devoid of a parasite [11-13]. This opinion has been confirmed in the studies of other researchers [14,16]. A comparative analysis of the methods of rehabilitation of the residual cavity revealed the highest incidence of complications when using the Delbe technique (capitonage) – 36.4%. The researchers attributed the high percentage of suture failure to the technical difficulties of hermetically sealing a rigid, malleable fibrous capsule, which leads to the eruption of suture material. Similar, though less pronounced, problems were characteristic of the invagination method. Drainage of the cavity, being minimally invasive, in 22.7% of cases did not provide adequate outflow and did not prevent suppuration, which required additional percutaneous interventions or relaparotomy. In this context, methods of omentoplasty and cyst abdominisation, which use viable tissues for tamponade and biological resorption of the cavity, seem to be more physiological. However, as demonstrated by the long-term results presented in this study, even these techniques did not completely eliminate the risk of disease recurrence.

The most significant long-term consequence of organ-preserving operations was a high (4.7%) rate of disease recurrence [14,15]. This fact confirmed the theoretical thesis that any remaining fibrous capsule tissue can potentially contain viable germ cells (scolexes), and the cavity itself serves as a site for the development of seromas, suppurations, and the development of biliary fistulas [16,17]. Thus, the fight against complications after organ-preserving interventions is essentially a treatment for the consequences of incomplete elimination of the pathological substrate. In contrast, radical operations (subtotal and total pericystectomy, anatomical resection of the liver) aimed at the complete removal of the fibrous capsule along with pericystically altered tissues fundamentally solve the problem of the residual cavity [18,19]. Complete elimination of the pathological focus is the main factor that caused the minimum recurrence rate in this study – 1.5%.

Notably, although radical interventions are technically more complex and involve the risk of intraoperative complications (primarily haemorrhagic and biliary), the structure of postoperative complications in this case fundamentally different. They are less "specific" for echinococcosis and more typical for extensive liver resections in general [20,21]. It is important to emphasise that most of these complications, according to the data, are manageable: biliary fistulas mostly tend to close on their own, and bleeding in 80% of cases was managed using conservative methods.

Thus, the choice of surgical tactics represents a clinical compromise: a lower intraoperative risk during organ-preserving surgery, but a high probability of delayed problems associated with the residual cavity, versus a greater but manageable intra- and postoperative risk of radical intervention that provides a radical cure. The results of this study strongly support a strategy of achieving the greatest possible radicality. However, total pericystectomy, which has become the most common method of radical treatment in this study (40.3%), seems to be the optimal balance between radicality and organ preservation. This technique allows completely removing the fibrous capsule, minimising the risk of recurrence, and simultaneously, if possible, preserve the functional liver parenchyma, which reduces the risk of liver failure compared with anatomical resection.

Notably, this study was retrospective in nature. The choice of the surgical method was largely determined by the individual characteristics of the case (size, location of the cyst, relation to blood vessels and bile ducts), which could introduce a certain systematic error into the comparative analysis of the groups. Based on the analysis, the authors suggest that, if technically possible, radical interventions, primarily total pericystectomy, should be considered as the method of choice in the surgical treatment of hepatic echinococcosis, since this approach provides the best long-term outcomes through complete elimination of the pathological focus.

Conclusions

The choice of surgical tactics should be individualised. In the absence of contraindications, radical interventions should be considered as the method of choice. The key advantage of these methods is the complete elimination of the fibrous capsule, which results in a minimal recurrence rate (1.4%). Organ-preserving techniques (abdominisation with omentopexy) are a reserve strategy for patients with high operational risk and difficult-to-reach cysts.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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